



SCOTTISH HOME DEPARTMENT
DEPARTMENT OF HEALTH FOR SCOTLAND

NUCLEAR GENERATING STATION

Report on the Public Local Inquiries into the applications by the South of Scotland Electricity Board to the Secretary of State for Scotland for his consent to the construction of a nuclear generating station at Hunterston, Ayrshire and into the South of Scotland Electricity Board (Hunterston) Compulsory Purchase Order, 1956.



EDINBURGH
HER MAJESTY'S STATIONERY OFFICE
1957
TWO SHILLINGS NET

Minute of Appointment of HARALD ROBERT LESLIE, M.B.E., T.D., Q.C., to hold Inquiries under—

- (a) the Electricity Act, 1947,
- (b) the Town and Country Planning (Scotland) Act, 1947, and
- (c) the Acquisition of Land (Authorisation Procedure) (Scotland) Act, 1947.

GENERATING STATION AT HUNTERSTON

The Secretary of State—

- (a) in exercise of the powers conferred on him by the Sixth Schedule to the Hydro-Electric Development (Scotland) Act, 1943, as applied by section 66 of the Electricity Act, 1947, HEREBY APPOINTS Harald Robert Leslie, M.B.E., T.D., Q.C., 8, Moray Place, Edinburgh, to hold an Inquiry into the application by the South of Scotland Electricity Board for the consent of the Secretary of State under section 2 of the Electric Lighting Act, 1909, as amended, to the construction of a nuclear generating station mainly on Hunterston Estate, and on other lands, all in the Parish of West Kilbride in the County of Ayr;
- (b) in exercise of the powers conferred on him by section 50 of the Town and Country Planning (Scotland) Act, 1945, as incorporated with the Town and Country Planning (Scotland) Act, 1947, by virtue of the provisions of section 100 of the said Act of 1947, HEREBY APPOINTS the said Harald Robert Leslie to hold a Local Inquiry into the applications by the said South of Scotland Electricity Board for planning permission for the construction of the said nuclear generating station, on the above-mentioned site and for access thereto, the said applications having been referred to the Secretary of State by direction under section 13 of the said Act of 1947;
- (c) in exercise of the powers conferred on him by paragraph 1 of the Fourth Schedule to the Acquisition of Land (Authorisation Procedure) (Scotland) Act, 1947, HEREBY APPOINTS the said Harald Robert Leslie to hold a Public Local Inquiry in connection with the South of Scotland Electricity Board (Hunterston) Compulsory Purchase Order, 1956, against which Order objections have been lodged with the Secretary of State and have not been withdrawn;
- (d) HEREBY APPOINTS the said Harald Robert Leslie to report on the said Inquiries to the Secretary of State.

(Signed) C. C. CUNNINGHAM,

Secretary.

Scottish Home Department,
St. Andrew's House,
6th May, 1957.

8, Moray Place,
Edinburgh,
4th July, 1957.

SIR,

I have the honour to submit my Report and Recommendations on the Public Local Inquiries held by me in accordance with my Minute of Appointment dated 6th May, 1957, into the applications by the South of Scotland Electricity Board for your consent to the construction of a nuclear generating station mainly on Hunterston Estate, and on other lands, all in the Parish of West Kilbride in the County of Ayr, and into the South of Scotland Electricity Board (Hunterston) Compulsory Purchase Order, 1956.

A copy of the transcript of the oral evidence together with the addresses of Counsel, and all the original documents and exhibits lodged in the course of both series of Inquiries, are available to you.

Attached to this Report are lists of the compearing witnesses, and particulars of the parties represented and the names of those representing them. The dates of the Public Hearings are also given.

In the special circumstances, I have had to rely greatly upon the results in the evidence of the well known, zealous and meticulous care given by the late Sir James Randall Philip. My debt to him is very real, as also to the Counsel, Solicitors and Witnesses concerned.

Not least am I most grateful to Mr. T. Cooper of the Scottish Home Department, who acted as Clerk to my predecessor and myself in both series of Inquiries. His unstinted service has been invaluable. I should also express my thanks to Mr. A. Gow of the Department of Health for Scotland whose advice in planning matters was of the greatest value to me, as also, I am sure, to my predecessor.

The Report is elaborate, but I felt that the undoubted wide-spread interest in this new source of power justified the ampler approach reflected in the evidence.

I have the honour to be, Sir,

Your obedient Servant,

(Signed) HARALD R. LESLIE.

The Rt. Hon. J. S. MacLay, C.M.G., M.P.,
Secretary of State for Scotland,
St. Andrew's House,
Edinburgh, 1.

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**REPORT TO THE RIGHT HONOURABLE J. S. MACLAY,
C.M.G., M.P., SECRETARY OF STATE FOR SCOTLAND**

SIR,

Terms of Reference

By Minute dated 6th May, 1957, in exercise of the statutory powers therein referred to, you appointed me to hold the following Inquiries, and to report to you thereon, viz.:—

- (a) An Inquiry into the application by the South of Scotland Electricity Board for the consent of the Secretary of State under Section 2 of the Electric Lighting Act, 1909, as amended, to the construction of a nuclear generating station mainly on Hunterston Estate, and on other lands, all in the parish of West Kilbride in the County of Ayr.
- (b) A Local Inquiry into the applications by the South of Scotland Electricity Board for planning permission for the construction of the said nuclear generating station on the above-mentioned site and for access thereto, the said applications having been referred to the Secretary of State by directions under Section 13 of the Town and Country Planning (Scotland) Act, 1947.
- (c) A Public Local Inquiry in connection with the South of Scotland Electricity Board (Hunterston) Compulsory Purchase Order, 1956 against which Order objections had been lodged with the Secretary of State and had not been withdrawn.

I shall refer to these three Inquiries as, respectively, the Electricity Act Inquiry; the Planning Inquiry; and the Compulsory Purchase Order Inquiry.

2. By Minute dated 31st December, 1956, the then Secretary of State appointed Sir James Randall Philip, O.B.E., Q.C., to hold Inquiries into the same matters and in pursuance of that commission Sir Randall Philip held Public Local Inquiries at Largs from 29th January to 13th February, 1957, but unfortunately was unable before his death on 2nd May, 1957 to report to the Secretary of State.

The respective Minutes of Appointment of 31st December, 1956 and 6th May, 1957 were in identical terms.

Inquiries

3. A preliminary discussion was held with representing parties on 10th May in Parliament House, Edinburgh to discuss the inquiry procedure to be adopted, when all parties agreed that the evidence and productions of the Inquiries held at Largs from 29th January to 13th February should be regarded by me as evidence taken on commission for purposes of the present Inquiries.

The Hearing in the present Inquiries took place in Barrfields Pavilion, Largs on 4th June, 1957, after due Notice and Advertisement. Previous to that, with the agreement of parties, two days were devoted to inspection of sites, viz.:—Thursday, 30th May, to the inspection of Hunterston and Barassie; and Friday, 31st May, to Culzean, Turnberry, Burnside, Ardmillan and Drummore. Accordingly, when the parties made further submissions to me on 4th June, I had already read the evidence of the previous Inquiries and had had the advantage of inspecting the various sites to which they desired to refer.

4. (a) Particulars of the parties represented and the names of those representing them at the Electricity Act Inquiry held on 4th June are given in Appendix I to this Report.

(b) The same parties appeared in the Planning Inquiry, and by the same representation.

(c) There appeared in the Compulsory Purchase Order Inquiry the following parties:—

(1) The promoters:—

The South of Scotland Electricity Board.

(2) The following objectors:—

Miss E. Hunter of Hunterston and the Trustees for the Hunterston Estate represented as aforesaid.

The Southannan Estate Trustees and Messrs. Robert B. McIntyre and Neil McIntyre, Poteath Farm represented as aforesaid.

(d) At the Inquiries held before Sir Randall Philip from 29th January to 13th February the representation was as above except that the Dean of Faculty was absent due to illness. Also at these previous Inquiries the United Kingdom Atomic Energy Authority were represented by Mr. W. A. Elliott, Advocate, on a watching brief instructed by Messrs. Morton, Smart, Macdonald and Prosser, W.S. Edinburgh; the Authority were not represented at the Inquiries held before me on 4th June.

Procedure

5. At the Inquiries held from 29th January to 13th February the following arrangements were accepted by the parties with regard to procedure:—

(a) It was agreed that the Electricity Act Inquiry be taken first; the Planning Act Inquiry second; and the Compulsory Purchase Order Inquiry third (Notes pp. 3 and 768).

(b) It was agreed between parties appearing in the Planning Inquiry that the evidence and productions in the Electricity Act Inquiry should be accepted also, so far as relevant, as evidence and productions in the Planning Inquiry, without prejudice to the right of any party in the Planning Inquiry to lead such further evidence, or adduce such further productions, as may be relevant to the Planning Inquiry (Notes pp. 3 and 768/9). Similarly, it was agreed between the parties appearing in the Compulsory Purchase Order Inquiry that the evidence and productions in the Electricity Act and Planning Inquiries should be accepted, also so far as relevant, as evidence and productions in the Compulsory Purchase Order Inquiry, and that it was unnecessary to lead any further evidence beyond what had already been led in the Electricity Act Inquiry (Notes pp. 3 and 768).

(c) It was further agreed that before any evidence was led in the Inquiries, Counsel for the promoters should make an opening explanatory statement applicable to all three Inquiries; and that thereafter in each Inquiry the promoters and compearing objectors would have the right to be heard in turn upon the evidence submitted by them, in a manner similar to that in a Court of Session or Sheriff Court Proof.

6. The proceedings at the Inquiries held on 4th June also followed the above procedure so far as applicable.

7. Government Policy

Government policy on the development of nuclear energy for peaceful purposes is set out in the White Paper "A Programme of Nuclear Power" published in February, 1955, as Cmd. 9389. In brief, the White Paper states that our future as an industrial country depends on the ability of our scientists to discover the secrets of atomic energy and on our speed in applying the new techniques. It is only by coming to grips with the problems of the design and building of nuclear plant that British industry will acquire the experience necessary for the full exploitation of this new technology. It states that the search for supplementary sources of energy is a matter of urgency made necessary by the country's great and growing demand for energy and especially electric power. While the demand for energy increases from day to day, it has to be kept in view that a large power station may take five or more years to complete, including finding the site, designing the station and building it.

In the light of all this, the Government has prepared a provisional programme of nuclear power covering the next ten years from the date of the Paper.

The policy envisages two types of reactor being brought into use on a commercial scale during the next ten years. The first type will be similar to those under construction at Calder Hall. The reactors will be gas-cooled graphite-moderated "thermal" reactors using as fuel natural uranium or slightly "enriched" uranium. It was envisaged that the first improved models could be designed and built so as to come into operation in about six years from the date of the Paper. The Paper foresaw that it would not be practicable to start building any commercial stations before 1957.

As to cost, nuclear stations will have a higher capital cost and a lower running cost than other stations, and will be run as base-load stations at a high load factor.

The policy involves the building of stations in the normal way by private industry for the Electricity Authorities, who will own and operate them. The United Kingdom Atomic Energy Authority, as the only body with the necessary experience, will be responsible for giving technical advice on the nuclear plant.

The whole development, involving new applications of science and a new technology, inevitably raises problems of staff training, organisation and design. To this end groups of firms have been formed.

The provisional programme for the construction of nuclear power stations as at the date of the Paper was as follows:—

- (1) The construction of two gas-cooled graphite-moderated stations (each with two reactors) would be started about mid-1957, the stations coming into operation in 1960-1961.
- (2) The construction of two further stations starting in 1958-1959.
- (3) The construction of four more stations starting in 1960, and a further four about 1961-1962.

The urgency of the matter has been stressed not only in the White Paper but in statements of Government policy in the House of Commons. The fuel power policy of the Government has, as one of its main objectives, to supplement supplies of coal with atomic energy as soon as possible. The then Minister of Fuel and Power in a statement in the House of Commons on the Second Reading of the Electricity Bill on 17th December, 1956, said "The Government are anxious to move as fast and as far as we practically can in the matter" (that is the Nuclear Power Programme). "The whole national situation absolutely demands it."

The reason for this is that the use of electricity is growing rapidly in all countries, and in this country consumption has virtually doubled every ten years.

The conclusion of the Paper is that nuclear energy provides a source of power potentially much greater than any which at present exists. The Paper also stresses that this formidable task must be tackled with vigour and imagination. "The stakes are high but the final reward will be immeasurable. We must keep ourselves in the forefront in the development of nuclear power so that we can play our part in harnessing this new form of energy for the benefit of mankind."

8. The South of Scotland Electricity Board

The Board was established by the Electricity Reorganisation (Scotland) Act 1954, 2 & 3 Eliz. 2 Ch. 60, and consists of the Chairman and Deputy Chairman and not less than three nor more than seven other members who are part-time. The over-all control and conduct of the Board's activities rests in the hands of the members. It meets as necessary. The day-to-day administration is carried out by the Chairman and Deputy Chairman, and the senior officers, including the Chief and Deputy Chief Engineers. A meeting akin to an executive meeting occurs normally once per week, when the permanent members and the senior staff discuss work in hand, and work projected, and the progress made. The Board is a public authority; an autonomous body whose functions include the three main branches of electricity supply, viz. generation, main transmission and distribution. In terms of that Act, the Board's duties include the responsibility of initiating and undertaking the development of all further means of generation of electricity within the South of Scotland District. Alternative means studied comprise coal, peat, water and nuclear energy. The District, broadly speaking, is that part of Scotland lying south of a line drawn between the Gareloch and the Tay. It covers an area of approximately 8,160 sq. miles; has a population of about 4,000,000, and includes the cities of Glasgow and Edinburgh. Fifteen counties, and parts of two others, are included in the territory. The main load centre is Glasgow and the Clyde Valley. By 1970, it is estimated that about 55 per cent of the total load demand for the District will come from Glasgow and an area radiating some 20 miles from it. During the year ending 31st December, 1956, the Board met a maximum demand for electrical energy of the order of 1,410 MW, being a 10 per cent increase over 1955. In line with experience everywhere, the Board estimate that the electricity supply industry must provide plant for their District to meet a demand which is doubling every ten years. They estimate that even taking into account all plant likely to be available, and taking into account imported supplies of power, the position of supply and demand for electrical power in 1964-65 may still be critical, and consider that such a factor as severe winter weather would then put supply significantly on the minus side of demand.

In the South of Scotland District during the period from 1948 to 1955, the electricity sold to consumers increased from 3,075 million units to 4,870 million units, an increase in seven years of about 58 per cent. During the same period, the simultaneous maximum demand in the District rose from 853 MW to 1,408 MW being an increase of some 65 per cent. Looking forward, in the light of such circumstances, the Board estimate that the 1961-62 load will have increased to 2,100 MW, and that by 1964-65 the system load will have risen to 2,530 MW, a rise of about 80 per cent on the present-day figures.

To implement their responsibilities, the Board before publication of the White Paper, had already indicated to the Atomic Energy Authority that

they would like to play their part in the development of nuclear power and to site at least one station in their area.

The Board have in fact a substantial construction programme under way and have approved plans for the installation of additional generating plant. Stations being constructed or extended at Barony, Dunfermline, Dalmarnock, Kincardine-on-Forth, and Brackhead, Glasgow, together with the proposed new nuclear generating station on the Ayrshire coast, and a source not yet fully decided upon, should provide an additional output capacity of 1,234 MW. The capital expenditure envisaged to fulfil the Board's whole generation programme from 1957 to 1964 is of the order of £100 million.

9. The United Kingdom Atomic Energy Authority (A.E.A.)

This Authority has hitherto been solely responsible for the pioneering of atomic energy in this country. It is accordingly the only organisation with the necessary experience of design, construction, operation and safety (for the public and the employee alike), to give technical advice on nuclear power plant. There is an Agreement, dated 20th August, 1955, between the Board and the Authority in terms of which, essentially, there rests with the latter the technical responsibility for ensuring that the knowledge and experience of the Authority is applied in the Board's projects to achieve a high standard of design, construction, operation and safety. The Authority has regard to the recommendations made by the Medical Research Council, and those of the International Commission on Radiological Protection, in the safety measures taken against the occurrence and effects of radio-activity within and outwith the station.

The Atomic Energy Authority experts at present alone have the knowledge to decide as to the suitability of sites for generating stations, in particular from the isolation and safety point of view. Some of the criteria relating to the selection of sites are known only to the Authority and are secret. Minutes and papers relating to these matters, and in particular recording the application of these considerations to particular sites such, for example, as Hunterston, are classified. They were accordingly not available in these Inquiries. A certificate to this effect under the hand of the Lord President of the Council was duly lodged in process.

One of the heads of the Agreement referred to above is that the Board "will select a site and will obtain the agreement of the Atomic Energy Authority as to its suitability for the erection of the proposed nuclear power station before taking steps to obtain the consent of the Secretary of State for Scotland".

10. The Reactor Location Panel (R.L.P.)

The link between the Atomic Energy Authority and the Authorities responsible for *inter alia* the development of electricity supply, viz. the South of Scotland Electricity Board, the North of Scotland Hydro-Electric Board and the Central Electricity Authority, is the Reactor Location Panel. In particular, the Panel is concerned with the siting of nuclear generating stations subject to the criteria referred to. The Chairman at present is an engineer of great experience in the field of atomic energy development. It has three specialist representatives from the Atomic Energy Research establishment at Harwell, two of whom cover subjects of health physics, and one covers the subject of the reactor physics. It also includes two representatives from the Industrial Group of the Atomic Energy Authority. One of these, a physicist, is a reactor and health physics specialist, another is a general engineer. The Panel also includes a member of the administrative staff of the Authority from the head office in London. In addition there is a representative from

each of the three electricity authorities referred to. The representative of the South of Scotland Electricity Board first joined the Panel in September, 1955. He is the Board's Chief Engineer. When he is unable to be present the Deputy Chief Engineer attends, or may do so, as necessary, together with the Chief Engineer. Because the Panel's papers and records of proceedings are classified as secret, the decisions come to and reports of the meetings are usually conveyed verbally through their representatives to the Boards concerned. The Panel meets monthly or more often as required.

The Panel having been set up as a Panel of the Project Health Committee of the Atomic Energy Authority on 28th March, 1955, has particular regard to radiological safety. Allied with its consideration of general policy and individual siting of reactors, however, it takes into account the engineering and economical aspects of siting. It is not however the planning authority in this respect. That is a function of the Board.

11. The Board's Sources of Supply

The Board have twelve steam generating stations and seven hydro-electric generating stations. Under agreement, also, some supplies can be obtained from the North of Scotland Hydro-Electric Board and the Central Electricity Authority. In 1956 the firm supply from the former was 275 MW. The supply available from the Central Electricity Authority is variable, and in fact amounts to plus or minus 150 MW. The Board have under construction within the programme referred to in paragraph 8 above a conventional steam coal-burning plant at Kincardine-on-Forth, conveniently sited for the coal fields in the east, which requires something of the order of one million tons of coal per annum. That station is phased to have the first half constructed by 1961, and the second half by 1964. It is also proposed to obtain supplies of electricity as necessary from the new nuclear factory at Chapelcross, near Annan, under construction by the Atomic Energy Authority. For the future, the Board also have in view the use of pumped-storage schemes. These schemes should fit in efficiently with nuclear power generating stations. Such stations are capable, at least at times, of continuous running during the twenty-four hours of the day. This means that at off-peak hours, and particularly during the night, surplus power can be used to pump water to a higher level where it is impounded and itself used for the generation of electricity. In the Board's area such schemes would probably be in the Galloway area.

12. Prototype Nuclear Generating Stations

Prototype stations have been built by the Atomic Energy Authority at Calder Hall and Harwell. Invaluable experience has been gained from these in the design and construction of nuclear stations and their associated problems, including safety, internal and external to the station. To enable industry to take advantage of this new source of power, the Authority has set up also a technical staff training school at Harwell and an operators training school at Calder Hall.

13. Basis of Industrial Application of Nuclear Fission

The industrial application of nuclear fission requires that the process occurs continuously and *under control*. In its simplest terms, the process is entirely dependent on the fact that every nucleus of an atom of uranium undergoing fission, due to collision with a small atomic nuclear particle called a neutron, releases two or more fresh neutrons. Some of the neutrons strike other uranium atoms leading to further fissioning, while some neutrons are absorbed in the materials of the reactor without effect. If the reaction were to continue, there would be a surplus of neutrons over those

absorbed, and the rate of fissioning would increase, giving an uncontrolled chain reaction. The reactors, however, are so designed that the process occurs in such a manner that an increased rate of fissioning leads to greater absorption of neutrons. The process thus self-stabilises. It is this process of controlled fissioning which, in essence, replaces the steam-raising power of the conventional station.

14. Design and Construction Generally, and Safety

Nuclear generating stations are designed by the contractors in close collaboration with the A.E.A. Electricity Authorities, such as the South of Scotland Electricity Board, do not design the stations but contract for them as a "packaging operation", i.e. buying the whole installation as designed. Of necessity, at least on present concepts, a station of this type incorporates two massive reactors and a turbine hall. The main features of the station are inevitably determined largely by functional, and not by site, requirements.

In the light of their experience on their prototypes, the Atomic Energy Authority believe that they have now designed a safe nuclear power plant. The plant incorporates qualities of inherent safety which, according to the Chairman of the Reactor Location Panel, make "run-away" virtually impossible. This position has been achieved as a result of the most close collaboration between engineers and scientists. They have evolved mechanical safeguards which provide, in the Chairman's words, against the consequences of even "the impossible and improbable occurring together". And it is apparently the case that nuclear explosion "cannot take place within one of these stations". Safety does not depend upon one safeguard, but upon a series of safeguards, which, broadly speaking, come into operation successively in the event of any abnormality occurring in operation.

The type of reactor with which these inquiries are concerned is one which employs gas cooling. It has a successful record of safe operation in this country, extending over almost ten years.

The Harwell reactor of this type has operated safely since 1948. The two industrial reactors at Windscale have each run safely for six years. In other words, the record of reactor safety in this country is so far clean. In the U.S.A. it appears that some 25 reactors have operated over 600,000 hours without any contamination of neighbouring property.

In general, the parts of the plant which contain the all important reactor system are constructed of steel plates welded together. The joints are minutely examined by X-ray to obviate defects. It is a feature in construction that the workmanship is inspected and tested by an independent, competent authority. In addition to the thick steel plates enclosing the reactor system, they themselves are encased in a massive, reinforced, concrete shielded structure.

One of the features of control of the nuclear reaction is the insertion of metal rods into the reactor core between the bars of uranium fuel. These rods absorb neutrons and prevent the reaction diverging. Further, the uranium fuel is separated from the cooling gas, CO_2 , by a sheath technically known as a "can". This "can" retains the radio-active products of fission of the uranium. Special equipment is fitted to the reactor to detect the slightest leakage through a can. Indeed it is apparently the case that very highly sensitive instruments are used inside and outside the stations to detect the slightest changes in the normal radio-active background. Should there be a significant rise in radio-activity over the natural norm, appropriate measures and procedures are known and planned to take effect. Some of these occur automatically. Indeed in the last resort, to the best of the knowledge and judgment of the

engineers and scientists who know about these matters, these plants "will literally shut themselves down because of the heat they produce".

These precautions are important and reassuring, as discharges from this type of station are both gaseous and liquid. The gas, CO_2 , is normally held in the reactor and is very rarely discharged. It is continuously filtered in the plant, and, even assuming an escape, is "virtually kept clean". It will carry a small quantity of short-lived radio-activity, but this is diluted as it mixes with the atmosphere. This type of radio-activity has a very short "half-life". After close study it has been estimated that this dispersed gas would not increase the ground level activity by more than 1/100th of the accepted safe tolerance. There is, of course, always a percentage of radio-activity in the atmosphere, which is inevitable and normal. The air used to cool the reactor shields is dispersed into the atmosphere from vents at roof height, or from stacks.

The cooling water is discharged into the sea. Upon the evidence, there is no noxious effluent or dust discharged from this type of station, and the amount of radio-activity discharged with the cooling water will be barely perceptible above the normal that is there. The proportion of radio-activity in the water would not exceed "what is commonly found in any ordinary drinking water supply". In scientific terms, the total radio-activity per month discharged into the sea with the cooling water would not exceed 7,500 millicuries. A curie corresponds to a gramme of the element radium. The same radiation arises from the natural soil covering one square mile to a depth of about 12 inches.

Strontium 90 is a substance which can be harmful in animals, human beings and fish. It is one of the substances which is released in the liquid discharged from this type of station. It is not discharged in the gases or air. Some percentage of strontium 90 will pass into the sea. It is not significant in the life cycle of seaweed. The cooling water discharged from the site of such a plant is equivalent to about 500 million gallons per day, including 7,500 millicuries of mixed fission products per month. On an average, these products will contain about 1.5 per cent. of strontium 90, and it is planned that the activity would be discharged at all times with the outlet pipe submerged in tidal waters. In the result, the discharge would contain an amount of strontium 90 which would be the equivalent of only about 1/400th part of the maximum permissible limit as prescribed by the International Commission on Radiological Protection.

When these matters, vital to safety, are viewed collectively or separately, one can accept the evidence, given as the printed word conveys, with patent intellectual honesty—"we believe very sincerely that in this design of plant we have designed a safe nuclear power plant", and that neither in operation nor through the liquid and gaseous discharges is damage or adverse effect at all likely for man, bird, beast, fish or plant. Generally, the increase in normal radio-active background in the immediate vicinity of a station of this type is said to be infinitesimal,—"less in its effect than wearing a luminous-dial wrist watch". Further, the type of radiation involved in operating such a station is not "a type which is attached to a chemical form which would be picked up by vegetables and accumulated in a concentration". It may also be observed that even where there may be significantly increased radio-activity, the adverse effects apparently accrue, not from passing contact, but from more continued exposure to its effects. Siting in isolated places reasonably remote from populous centres would seem to be regarded as an *insurance* against exposure of the inhabitants to such continued exposure, should a dangerous escape of radio-activity occur for any reason. It may well be that in the future

these stations will be placed in proximity to the industrial load centres. At present, while no danger is apprehended, it would seem entirely proper to observe the maximum safeguards. Some aspects at least are doubtless still exploratory.

It is satisfactory to note upon the evidence that the conclusion with regard to the non-harmful effects of the operation of this kind of station is based, not merely upon theory, but upon detailed experiments and investigations at the Windscale and Calder Hall establishments on the Cumberland coast, and that escapes of radio-activity of varying magnitude have been taken into consideration.

15. Fuel

The uranium fuel is provided by the A.E.A. It involves no hazard whatsoever before being placed in the reactors. After use, however, it is intensely radio-active. It is removed by road in large, very thick, steel or cast-iron containers. These should be immune from damage due, for example, to road accident. Prior to removal, the spent fuel is "allowed to cool", that is the radio-activity is allowed to decrease by being submerged for some three months in water. The containers referred to weigh 20 to 30 tons each, and their removal would require approximately one vehicle every two or three days from the station site.

It may be noted here that present experience indicates that the life of a reactor is about twenty years, from the point of view of its nuclear functioning. From the point of view, however, of the integrity of the metal pressure containing system it might have a very much longer life.

16. Siting of Stations

The first essential factor is isolation. Mention of this has already been made in paragraph 14. This, as previously stated, is a matter entirely within the discretion and responsibility of the Reactor Location Panel. It would seem that little danger is to be apprehended but, inevitably, with this new source of power, and the harnessing of it for constructive peaceful purposes, and the wide-spread public concern about the effect and consequences of atomic explosion, there is meantime a strong psychological element in the siting of the stations. Proximity to the unknown tends to beget fear. Meantime, accordingly it is the policy to site them in locations which are about five miles from centres of population of approximately 10,000. There should also be few people in the immediate location of the station. Quite obviously, apart from proximity to centres of population, there are other factors which govern the Reactor Location Panel's decisions as to appropriate sites. These are, however, as stated, meantime secret. Indeed the matter is further complicated in this respect by being the subject of international agreement restrictive of the dissemination of detailed information. The facts accordingly are not available for independent judgment, and indeed may be assessable only in the light of specialist knowledge. As matters stand, one can only rely upon the knowledge, experience and integrity of the members of the Panel. Their responsibility is immense. The recorded evidence leaves one in no doubt that this trust is accepted and is being conscientiously discharged.

There are also engineering considerations to be taken into account. The site must obviously be big enough to take the main group of buildings and the ancillary works. Reactors for a station of the type with which these inquiries are concerned weigh about 71,500 tons each and cover about 28,000 sq. ft. of ground. To carry this mass, there should preferably be a rock foundation and, so far as practicable, a level site. As cooling water

to the quantity of about 18 million gallons per hour or more is required, a coastal site is obviously requisite. The site should also be below 30 ft. above sea level. Below this height nearly all the energy in water from the sea can be recovered by a siphon effect. On the other hand every foot above about 30 ft. involves pumping water up direct, and this involves unnecessary extra pumping power. A circulating water system is also required. It should be as short as possible, but adequate separation is necessary between the intake and outlet works. A sufficient depth of water is also necessary, adequate to submerge the seaward openings of the intake and outlet tunnels.

A further requisite is sufficient water for the boiler make-up and cooling pond. This may be of the order of 200,000 gallons of fresh water per day.

It is also an advantage to be reasonably near a main road and to have adequate drainage. Not least important is proximity to the load centre to which the power is to be distributed.

There are, of course, in addition to the important factors of amenity, both public and private, the need to minimise the use of agricultural land for these structures, and the avoidance of damage to sea fisheries, where practicable.

17. The Board's Project and Search for a Site

As early as January, 1955, the Board had canvassed the possibility of building a nuclear generating station in the South of Scotland, and in February, 1955, the Government White Paper (Cmd. 9389) was published. The Board's Chairman was instructed by the Board to treat the matter as one of urgency. The Board's Minutes of Meetings then record that on 4th March, 1955, the Chairman was authorised to represent to the Atomic Energy Authority that one station at least be erected in the Board's District. It appears probable that the Chairman did so prior to the establishment of the Reactor Location Panel.

That Panel was established on 28th March, 1955.

In June, 1955, the Chairman verbally instructed the Chief Engineer to make investigations as to possible sites for such a station. The Board's engineers accordingly carried out investigations. These, in one form or another, apparently extended over some sixteen months.

At first the search was for potential sites to accommodate a station capable of an output of 160 MW. Such a station it was estimated would require an area of about 25-30 acres. Between November, 1955 and February, 1956, the conception as to the size of the requisite station altered. Indeed, Government policy had moved towards an expanded or accelerated programme. On 12th December, 1955, the Board resolved, following upon a Memorandum (B.137) by the Chief Engineer, dated 2nd December, 1955, that:—"the proposals contained in the Memorandum be approved on the basis of the construction of an atomic energy station to be commissioned in 1961 and with a sent-out capacity of approximately 250 MW". Sent-out capacity of that magnitude requires an installed capacity of about 300 MW. It involved a much larger station. A much larger area of site was also necessary.

An atomic type of station requires far more prefabrication on the site than the conventional type of station. This is because some of the parts are of such large size that they could not possibly be transported in their completed form over any roads. Further, the quantities of concrete needed for various sections of the buildings and foundations are enormous. And finally, parts of the heat exchangers must be so scrupulously clean that the final stage of polishing and burnishing is done on the site immediately

before they are erected. Some of these factors had become apparent only after the Deputy Chief Engineer had visited Calder Hall in August, 1955, to gain first-hand experience in this new field of engineering.

The Memorandum B.137 had been preceded by a meeting between the Chairman, with the Chief Engineer, and Sir Christopher Hinton, F.R.S., Member for Engineering and Production of the United Kingdom Atomic Energy Authority, anent the construction of a nuclear energy station by the Board. On 14th November, 1955, the Board had agreed, "that the full-time members would consider the matter with a view to bringing forward a report". That Memorandum and the Board's resolution of 12th December, 1955 resulted.

Meantime the search for suitable sites had been proceeding. The survey commenced with the Rosneath Peninsula, but none was found there. A report from the Deputy Chief Engineer dated 13th July, 1955 confirms this.

The search was advisedly confined to the West Coast because, as stated above, the main load centre is in the west, namely, Glasgow and the Clyde Valley. Studies of the estimated positions of supply and demand in the east and west areas of the Board's District also indicated that by 1961 the new coal-fired station at Kincardine-on-Forth would provide ample capacity of electricity in the east. On the other hand, there would still be an inadequacy in the west. Further the Board had in view that a primary function is to generate and distribute electricity at the lowest practicable cost to the consumers. It would be quite uneconomic to transport the great quantities of coal required from the east to the west. Particularly is this so when the coal price tends to rise. Further, supplies may not match future requirements. A coastal site in the west was the object of the search.

Broadly speaking, the survey for sites was conducted to the north of Ayr, from the Greenock area, in June and July and subsequent months in 1955; and the survey to the south of Ayr began about November, 1955 and continued until about March, 1956.

Generally stated, the surveys were visual. They covered an area from the Gareloch in the North to Loch Ryan in the South. It is no doubt the case that probable sites can in many cases be eliminated visually.

On 4th July, 1955, one of the Board's engineers reported on six possible sites. These were:—Lunderston, Ardgowan, Knock Castle, Black Rock, a low plateau just north of Portencross, and Ardnell Bay, all shown on the conjoined Ordnance Survey Map Sheets Nos. 59, 67 and 72 (Seventh series), Production No. 6/4.

It may be observed that these sites were submitted on the assumption that road access to a site of 10 to 12 acres, with cooling water facilities for at least 100 MW, was all that was required. The reporting engineer favoured the area just north of Portencross, subject to the area being adequate. After consultation with the Chief Engineer, three of the six sites were submitted to the Reactor Location Panel. The elimination of three of the sites was decided upon by the Chief Engineer between September and November, 1955. The Panel met to consider the other three sites on 17th November, 1955. They were Ardgowan, Black Rock and the low plateau just north of Portencross. Sketch maps and photographs with information regarding the populations in the respective neighbourhoods were also submitted.

At that meeting of the Panel, both the Board's Chief Engineer and his Deputy were present. The Panel reviewed the three sites relatively and considered that the area between Portencross and Black Rock was much superior

to that at Ardgowan, and asked the Board, through their representatives at the meeting, to make a thorough investigation of the population in the area between Portencross and Black Rock. They so requested the Board because they felt that a suitable degree of isolation would be found in that region. The Portencross site was NOT cleared by the Panel from the isolation point of view. One reason given for this was the proximity of the site to the dwellings at Portencross.

As stated above, the bases of the Panel's decisions although recorded are not available in Inquiries, being classified under the Official Secrets Act, 1911, section 2 (1). This involves that the communings between the Panel and the Board, conducted through their representatives, are generally verbal and not written. These are secret and, therefore, to any Commissioner, unknown factors which preclude assessment of the validity of decisions. In any event, even if disclosed, a layman probably would not be competent to adjudicate without the assistance of an Assessor in this new and highly technical field.

The comment may be made here that the Board's Minutes of Meetings make no reference to consideration by the Board *as a whole* of alternative sites, nor, in particular, of those submitted from time to time to the Panel. It may be said, however, that there is some evidence to the effect that the Board members individually did interest themselves closely in all that was going on, and that as a result of the executive meetings above referred to, they were apprised at least generally of developments. Without infringing the secrecy aspect, it would seem desirable that the Board *as a Board* should consider this important aspect of siting to obviate the apprehension that they may simply be "rubber-stamping" a finally effected selection of a site,—a *fait accompli*. The Chief Engineer and his subordinates seem not to have been taken into consultation at any formal meeting of the Board, albeit his reports or some of them, were considered at such meetings. Owners and occupiers of lands selected for development naturally look to bodies such as the Board fairly to evaluate their rights and interests in the scale with others. It is undesirable to give grounds by word or act for the slightest impression of unconsidered expropriation. In this case the situation was exacerbated by the entry of some workmen on the Hunterston lands, and flagging of some parts, without prior permission. When brought to the notice of the officials of the Board, a prompt apology was tendered. Excess of zeal does not atone for trespass. It is proper to state, however, that there is no evidence whatever that these unwarrantable intrusions were either instructed or encouraged by any member or officer of the Board.

The Board's Chairman most laudably and energetically set out to achieve a nuclear generating station for Scotland. Urgency was stressed by Government policy and by the growing need for electrical power in the industrial west. Secrecy inevitably veils aspects of the considerations, particularly as to isolation and safety of station sites. Between urgency and secrecy and the adventure of the new development, it may be that the more formal aspects of conducting the public business of the Board were overlooked. No part-time member of the Board gave evidence, and the matters alluded to were closely sifted in the evidence. There is nothing in that evidence to impugn the integrity of the members of the Board, nor in particular of the Chairman, Deputy Chairman or the senior staff.

On 19th December, 1955, the Panel refused to pass the Black Rock and Portencross sites in applying their isolation criteria. They also ruled out Ardgowan. They felt however that the Board could appropriately investigate the coastline from points between about three-quarters of a mile south of

Goldenberry and one mile north, from an engineering point of view. Isolation favoured that area.

On 16th February, 1956, the Panel was re-convened. The Board's representative stated, as was the case, that Goldenberry Farm, a likely site for the station, was part of a trust property and there would accordingly be considerable difficulties in the way of purchasing land there. In brief, a condition of the trust and its benefactions was the maintenance of the estate as an entity. Goldenberry Farm is part of Hunterston estate. The Panel therefore advised the Board to ascertain if any equivalent site could be found elsewhere on the coast. This Hunterston site satisfied the Panel's criteria for isolation and safety. Prior to this meeting, the Board's Deputy Chairman had called on Miss Hunter, the proprietrix of the Hunterston estate, to see if she would be willing to sell to the Board the area of land necessary for the project. Her solicitors confirmed later that for a variety of reasons she could not see her way to do so. The trustees concurred in her view.

Following upon this, and after further surveys to the south of Portencross, new possible sites were considered by the Board's engineers and officials, viz.: proceeding from north to south—Burnside, Ardmillan, North Lendalfoot, Carleton Port, Drummore and two at Ballantrae. Three of these were submitted to the Reactor Location Panel on 15th March, 1956. They were Burnside, Ardmillan and Drummore. All passed the test for isolation, and were recommended for more detailed consideration. This further consideration took place at the Panel meeting on 18th April, 1956. The view of the Panel was that the Burnside and Ardmillan sites were, from the point of view of isolation, marginally not as good as "Goldenberry", i.e. Hunterston. They also considered that Drummore might be reserved for some future project. It too satisfied the isolation factor.

On 21st September, 1956, the Board, through their representatives on the Panel, tabled their final proposals for "a site which they had selected" to be known as the Hunterston site. This was the first occasion upon which the Panel considered Hunterston as a specific site for the project. They looked again at the data provided and concluded the degree of isolation to be adequate, and in particular the criterion was satisfied that there should be very few houses near to the station. In so deciding, the basic consideration was said in evidence to be suitable isolation. The Chairman of the Panel said that in addition, "We like to have in mind other engineering considerations, since judgment is needed in the cost of isolation".

Hunterston site at this stage, by a process of elimination, was the selected choice of the Board's expert advisers, and it satisfied the Panel. The area of land potentially available was sufficient for a station giving 300 MW of sent-out capacity, the site was level, backed inland by rising ground and apparently offering good rock foundations. Its proximity to the sea afforded prospect of adequate intake and outlet arrangements for the cooling water drawn from the sea.

The site is approximately six miles south of Largs, Ayrshire, between Fences and Goldenberry Farms and the sea. It covers land which is part cultivated and part grazing.

As Miss Hunter felt herself unable to allow access for the necessary further site investigations by borings, the necessary authority was obtained by the Board under the Town and Country Planning (Scotland) Act, 1947, section 99. Permission to enter was, however, subsequently given voluntarily. The borings confirmed that the strata were very suitable for the project.

On 8th October, 1956, the Board had considered a Memorandum (B.135) by the Chief Engineer and the Secretary on selection of a site for the nuclear station, dated 3rd October, 1956. It stated *inter alia*: "Several sites along the Ayrshire coast have been examined to determine their suitability for the construction of the new station. The site which appears to meet all the requirements is an area of arable ground extending to some 70 acres forming part of Hunterston Estate in the Parish of West Kilbride, Ayrshire, owned and occupied by Miss Eleonora Hunter of Hunterston". The Board resolved to acquire the site, subject to the results of remaining bores being satisfactory, and to instruct the Secretary to obtain the consent of the Secretary of State in terms of section 2 of the Electric Lighting Act, 1909, and section 13 of the Town and Country Planning (Scotland) Act, 1947, to the construction of the proposed station.

Overtures were made to the three proprietors concerned for purchase by agreement of the land and foreshore considered to be necessary for the project, but these failed. Accordingly, at their meeting on 29th October, 1956, the Board, having considered Memorandum (B. 136) by their Secretary, dated 24th October, 1956, resolved to make and seek confirmation of the necessary Compulsory Purchase Order.

The Contract for the Proposed Station

18. On 22nd May, 1956, invitations to tender "for the design, manufacture, erection, commissioning and maintenance for the maintenance period, of a Nuclear Power Station in accordance with the Conditions of Contract and General Specifications attached" were sent to A. E. I.-John Thompson Nuclear Energy Co. Ltd., The Nuclear Power Plant Co. Ltd., The Atomic Power Projects and G. E. C. Simon-Carves Atomic Energy Group. Subsequently, by letter to the various groups dated 13th September, 1956, the Board's Consulting Engineers requested them to quote "an overall price" . . . "for a complete nuclear power station based on site conditions similar to those at Bradwell". The groups were to submit their tenders by 1st November, 1956.

At the date of request for tenders, no site had been selected for the station. The tenders were therefore requested on the basis of construction on a *typical*, and not on an actual, site.

On 12th December, 1956, the G.E.C. Simon-Carves Atomic Energy Group tender was accepted, subject to fulfilment of certain conditions, including the obtaining of the necessary statutory consents to build the station and the obtaining of a suitable site.

The subject of the contract was understood to be the largest power station in the world. Its estimated cost, apart from transmission charges, is somewhere in the region of £37 million. It will have an output of electricity to the value of about £4 million per annum and will produce about one quarter of the total output of electricity in the South of Scotland.

19. Technical and Other Particulars of the Proposed Nuclear Generating Station :

(a) Capacity.

The electrical output will be of the order of 250/300 MW.

(b) Particulars of Plant

(1) Reactors

Two nuclear reactors will be used, each with its associated six or eight heat exchangers, giving rise to a net electrical output of 125 to 150 MW, and a heat output of 500 to 550 MW, with the necessary ancillary plant.

The reactors will be of the gas-cooled, graphite moderated type.

The reactor core will be enclosed in a steel pressure vessel, and finally by adequate concrete radiation shielding, the whole being enclosed in a suitable building.

The coolant will be circulated under pressure in a closed system through the reactor and the heat exchangers.

This coolant will be CO_2 at a pressure not greater than 150 lbs./sq. in.

(2) The Heat Exchange Plant

Twelve to sixteen heat exchange units will be required, each having a maximum continuous evaporative capacity of 200 to 275 k.lbs. of steam per hour, complete with the necessary ancillary plant.

(3) Generating Plant

(i) Four to six turbo-generator sets of 50 to 75 MW output with the necessary ancillary plant.

(ii) Steam pressure at turbine stop valve—not greater than 750 lbs./sq. in.

Steam temperature at turbine stop valve—approximately 700°F.

(iii) Generator voltage—Between 11·8 and 33 kV.

Switching voltage—132 kV., 275 kV. and 33 kV.

(c) Buildings

The general appearance and main elements will be those of a nuclear generating station as typified at Calder Hall.

Photographs of the Calder Hall station indicate the probable layout of the buildings. It may be noted, however, that extract vents or stacks (chimneys) will not be required; nor will cooling towers be needed. In the process, a drawing, Production No. 4, and a model, Production No. 26, also demonstrate the probable layout. The accuracy of the model was disputed, but it is usefully indicative.

The reactors are housed within the tallest buildings. These are 202 ft. high and they occupy about 200 yds. in length of ground. Each with its six or eight heat exchangers weighs about 71,500 tons distributed over approximately 28,000 sq. ft.

Occupying the space lengthwise in the centre, with the reactors behind and at either end, will be the turbine hall, housing the electrical generating plant. This hall is 70 ft. high.

The whole plant is housed in three main buildings and thirteen office buildings and compounds, with additionally, the switch compound occupying a rectangular area some 900 ft. long by 400 ft. wide. It is not proposed to enclose the compound in any building. Because of the danger of flooding, it is inadvisable to sink these compounds into the ground.

It may be remarked that the disposition of the various buildings may to some extent be varied.

(d) Cooling Water

(1) The water will be drawn from, and returned, to the Firth of Clyde.

(2) The quantity circulated will be about 18/24 million gallons per hour.

(e) Fuel Delivery

Consignments of nuclear fuel will be delivered to the station by road. Irradiated fuel elements will be removed by road in suitable containers to the chemical processing plants of the United Kingdom Atomic Energy Authority.

(f) Effluents

The station will not produce ash. It is asserted that there will be no harmful discharge of radio-active wastes. This assertion is supported by the evidence.

In place of stacks or chimneys there will be main vents in the roof of the reactor buildings for the discharge of ventilating air, and it may be on occasion, although very rarely, of CO₂ coolant.

The main part of the generating station comprises the two nuclear reactors and the heat exchangers. This part corresponds to the steam raising plant of a normal coal fired station. Steam is taken from the exchangers to the electrical generating plant in the turbine hall with its four to six turbo-alternator sets. There, power is generated, and is taken by the transformers, and then by cabling to the switch compound. Thence, the electricity is fed into the grid transmission system.

The cooling water is required for the condensers of the turbine. There, the steam is converted back into water for return to the heat exchangers.

Uranium and graphite are kept in a large store, the former being fed into the reactors by means of a charging machine. This machine also removes the fuel elements therein. Those are transferred to the cartridge cooling pond between the two reactors where they are submerged in the fresh water until removed from the station. The cartridge cooling pond is housed in its own separate building.

The charging machine and material comprising the core of the reactors, including the graphite, control rods and radio-active effluents, require their own group of buildings, coupled with decontamination facilities for the operators of the works.

Ancillary services, equipment and buildings cover the essential services, water supply, sewage disposal, fire-fighting, administration and welfare; as also vehicle hangars, and workshops for vehicle and plant repair, CO₂ store and police lodge. The administration and canteen building will comprise laboratories, main offices, cafeteria, kitchen, changing rooms and medical centre.

The plan, Production No. 4, with its legend adequately portrays these various features in a proposed lay-out.

Apart from the structures, of course, accommodation is required in terms of ground space for roads, service pipes, cable runs, culverts, vehicle parking and turning places, and the like.

Not least in terms of area required, during the constructional stage, is the need of the great number of contractors and sub-contractors for space for plant and assembly work. A 300-ton crane, known as a Goliath crane, and the necessary rails will also have to be accommodated, to lift and position the very large components as and when they are assembled on the site.

20. Personnel

The construction period is expected to extend over a period of about five years. It is estimated that the labour force required will be roughly as follows:

1st year: beginning with 400 and rising to 1,200.

2nd year: 1,200 rising to 2,000.

3rd year: 2,000 rising to 2,200.

4th year: 2,200, but reducing to 1,800.

5th year: 1,800, but reducing to 300/400.

It is intended to recruit this force locally in the West of Scotland, but extending if need be to the Glasgow area. They will be transported by bus and/or train to the site.

A construction or hatted camp to house "probably not more than 350 men" would be required; in addition to this number, however, 40 to 50 staff members would require to be housed there also. The camp will not be on the station site.

In control of the site there will be some 35 engineers who will be housed in the neighbourhood, but not on the site.

The area required for the construction camp should not exceed twelve acres, and it should be as close to the site as practicable. The proposal is to negotiate with landowners in the vicinity of the station site to rent land for the purpose. Compulsory powers have no application.

When the whole project is completed the number of staff and employees required to operate and man the station will be about 300 to 350 persons.

21. Economics or Cost

It is established upon the evidence that wherever the station be sited on the coast of Ayrshire, the output of electricity from the station must come into the Board's main distribution system a little south of Paisley, about Crosstobs. That is to be one of the focal points in what will be the Board's future very high voltage network. The maximum capacity of the line there will be about 280 MW. The diagram, Production No. 27, very aptly illustrates the position. Paisley area is in immediate proximity to the main load centre. The power which goes to Paisley would be intended mainly for the Glasgow and Clyde Valley district, and not for areas to the south.

Some of the current from the proposed station will probably be fed into the Greenock—Saltcoats line. It is normally run at 60 to 70 MW, but in emergency can carry 90 MW. About 50 MW from the station may be fed into that line.

Transmission from an area about Portencross northwards would be at 132 kV. Should the station be sited at Hunterston, provision would be made by insulating the lines for 275 kV. This is in case in the future another station is to be put in commission in Ayrshire. By means of transformers the voltage could then be stepped up from 132 kV to 275 kV. If the station were sited further south, however, the electricity would require to be sent out at 275 kV due to the great increase in distance to Crosstobs. It would be uneconomic to transmit thence at 132 kV. This increased distance from the main load centre is of real moment as regards all the possible sites canvassed in the inquiries southwards of Portencross.

Junction with the local line, i.e. Greenock—Saltcoats—Kilmarnock etc. would require a line of 132 kV. towers. The main electricity would require a double-circuit line of its own to Paisley. That would be a very heavy line costing anything from £23,000 to £26,500 per mile.

The estimate for putting two sets of cables underground is given as about £160,000 per mile, but for very technical reasons the prevailing view of the engineers is that the main cables should certainly not be put underground.

Including transmission costs, the overall cost of the proposed station may be in the region of £40 million. Excluding these costs the estimate is £37 million. In relation to a figure of this magnitude the view was expressed in evidence, and may probably be accepted, that any plus or minus sum becomes of significance only when of the order of £250,000.

As stated above, the value of the electricity output will be about £4 million per annum.

These nuclear stations make possible the adoption in Scotland of pumped-storage schemes. Once the capital cost of a station is met, the running cost is very small—said to be about half the cost of running a coal-fired station.

There is one other general point which falls to be noted here. The weight of the evidence is, that not only does increasing distance of the station from the tee-in position at the main load centre cause a steep rise in the installation cost, but, with increasing length of lines, transmission decreases in efficiency. Losses increase, due to increased vulnerability; and maintenance and replacement become much more expensive.

22. Procedure as to Site Selection

Through their Consultants, the principal Objectors had investigations carried out along the Ayrshire coast with a view to submitting possible alternative sites for consideration.

This factor of alternative sites raises a very difficult procedural, and indeed substantive, issue. As the late Commissioner observed in the course of the evidence, the inquiries cannot be conducted on the basis of a multiple-pointing on sites. Fully to explore each alternative site put in issue would require inquiries within inquiries and the presence, if so advised, of all the owners, occupiers and others having a locus to object to, or support, the proposal with regard to each. One could envisage indeed parallel full scale inquiries afoot together, or endless successive inquiries as the project was passed on from one possible location to another.

Expense too has an important bearing. Many persons or bodies with an interest to object might find it impossible to finance the expert investigations necessary to ascertain and support in evidence probable alternative places. In any event, as matters stand, the full criteria which establish a satisfactory degree of isolation are unknown to such persons or bodies, being classified material. This secrecy is an element, no doubt essential at present, which undoubtedly circumscribes the range and opportunity for investigation.

Elimination of sites must inevitably take place at some stage. The Board, in consultation with the A.E.A. through the Reactor Location Panel, is probably best circumstanced to effect this. It would no doubt minimise the scope of controversy if, within the bounds of the classification referred to, the full board, as a Board, after any necessary consultation with its experts and senior officers, were able to justify its eliminations and final selection in public. In other words, it would greatly allay misgivings on the part of those ultimately directly affected if it could be shown that the selected site was advisedly put forward by the Board after full consideration of a "short list" of sites.

23. Sites suggested by the Objectors

At the end of the day it was reasonably clear that, as possible alternatives to Hunterston, there remained for serious consideration the potential sites at Culzean and Turnberry.

As indicated above, it would seem to be clear that failing the Hunterston site, neither of these could presumably be taken over or developed for the

project without all the necessary relevant procedures and inquiries being followed through.

Two sites suggested by the Objectors, namely at Barassie Sands and Brest Rocks (near Milton) had not been considered by the R.L.P. The Panel's chairman in evidence said however, that speaking personally, it was at least doubtful if they would satisfy the necessary basic isolation tests. He felt that he personally would advise against using the former site in particular. Barassie also would involve some levelling of the site, some considerable reclamation of the foreshore area and the building of a sea wall. The tunnelling required for the circulating water would be much longer also and more expensive than in the Hunterston proposals. Similar considerations affect the Brest Rocks site. These sites were not seriously pressed as suitable alternatives.

As to Burnside, quite apart from the transmission distance, the processing of seaweed in the factory of Alginates Ltd. there, and the uses to which the resultant products are put, cast much doubt on the advisability of having a station there. Even minimal increases of radio-activity in the raw product might adversely affect, for example, photographic processes.

Ardmillan as a site received general approval in principle. The distance from the load centre, however, would add very greatly indeed to the cost and no one could maintain this to be a really practicable proposition at present. It was of interest to observe that arable land would be involved, and land of good quality. There was indeed evidence that severance of about 100 acres for a station site would be "disastrous" to the economy of the farm.

The main emphasis was put upon the Turnberry site. Before turning finally to it, however, reference may be made to Culzean Bay.

Access to Culzean Bay is not without its difficulties because of the rather steep descent from the high ground to the shore, but this may not be too difficult nor too expensive to surmount. It would however be necessary to reclaim a considerable area of the shore, as the available land is a long and narrow strip. This would involve the construction of a sea wall of some 3,000 to 3,500 ft. in length, with the necessary infilling behind it. The experts on either side were agreed that these works would involve extra cost over the Hunterston project. Their estimates varied between £570,000 and something in excess of £1 million. The Board's engineers and consultants also anticipated that preparation of this site would cause a delay of from one to two years in their planned programme.

The estimates on both sides were given under reservation as to what borings might reveal about the disposition and nature of the foundation rock. Additionally also, there would be a considerable increase in the transmission costs due to increased distance from Crosstobs in contrast to the Hunterston site. Crosstobs to Culzean is about 42 miles; to Hunterston it is about 23 miles. The site, however, would probably satisfy the R.L.P. standards for isolation.

The nearness of Culzean Castle is a factor involving amenity.

Turnberry Point was most strenuously pressed as THE alternative site for present purposes. It has never been submitted to the R.L.P. so that the effect of its proximity to the villages of Milton and Maidens is not known. Isolation may be marginal, although upon the construction of the Panel's (classified) rules by the Board's representative on the Panel, he felt it would not pass. The area is the site of a now disused war-time aerodrome, near to the lighthouse and an impressively situated War Memorial. The whole weight of the evidence is that from the civil engineering point of view this

is, as to feasibility and cost, a satisfactory alternative to Hunterston, subject to reservations by the Board's engineers as to the rock foundations being proved by borings, and as to the rocks offshore presenting no insuperable difficulties for the head works of the water circulating system. Access to the site would present no problem. There would be no loss of agricultural land, although three holes of the golf course would require to be taken over or realigned. There would be some difficulty in recruiting and transporting labour.

Hunterston is however about 23 miles distant from the essential tee-in point south of Paisley while the distance from Turnberry is 47 miles. The additional capital cost of construction of the transmission system from Turnberry over Hunterston would accordingly be of the order of £1.6 million.

It has to be borne in mind that the owners and others directly concerned in any proposals to erect a nuclear station at Turnberry were inevitably not represented at these Inquiries. Their attitude is accordingly unknown, as also what new factors they might educe.

24. The Case for the Board

(a) General

Broadly speaking, the Board seek by this project to go far towards fulfilling their essential function of ensuring adequate supplies of electricity, from a much needed new source, at economic cost, to the consumers in the main load centre in their District. They also seek to match with physical achievement the Government's policy and sense of urgency. The project would keep Scotland in the foreground in all aspects of the industrial application of nuclear energy, and the necessary related technical research and training. Scottish industrial firms are associated with each of the four groups of manufacturers. It would tend to encourage those and other firms to participate in the new industry. The project would also serve as an outlet for graduates from the Scottish colleges and universities and as a centre of field work for them. It should lead to the development of pumped-storage schemes. The Board maintain that the public interest and public need are very great. They also submit that at Hunterston they have found a site in all particulars fully satisfactory for the erection of the proposed station.

It may be said at once that apart from the crucial issue as to Hunterston being the appropriate site for the station, the Board's other propositions are not really controverted. Indeed it is generally accepted that such a station is necessary, and should be built, and indeed should be built in the Board's District. The fact that the Glasgow area and the Clyde Valley constitute the main load centre to be provided for is established. It is also established upon the evidence that the station should be sited on the Ayrshire coast, with due regard to reasonable proximity to the main load centre. At a late stage of the Inquiries, 822 persons in Fairlie and West Kilbride by a letter jointly intimated their support for the Board's project.

(b) The Site

The conclusion is irresistible that the Hunterston site affords very satisfactory features from the civil engineering point of view, and also as regards access and the general functioning and operation of the station.

It is approved by the Reactor Location Panel as satisfying the requirements of isolation.

It is 23 miles from the load centre. Potential sites further south are much more distant from that centre. Transmission distance is undoubtedly an important factor from the point of view of efficient transmission, and of capital and maintenance costs.

Transmission lines should be as short as practicable. Increased length involves increased damage and loss hazards due, for example, to lightning or gale damage. Wayleave difficulties also inevitably increase.

As stated above, the estimated saving in transmission costs from Hunterston is something in excess of £1½ million compared with the like costs from Turnberry. The relevant estimates are given in Production No. 47.

The Hunterston site is level, self draining, and is about 12 ft. above sea level. It covers, apart from the foreshore, some 90 acres. The area is believed to be that of a raised sea beach. The rock strata, confirmed by borings, are very suitable. In the south of the area, the rock is at surface level: in the north, it lies at about 48 ft. below the surface level, and where it is proposed to site the principal buildings, as in Production No. 4, the rock depth does not exceed 18 ft. below ground level. In consequence, the main buildings could be "carried directly on to the rock foundations at quite shallow depth (allowing) of the simplest type of foundations of all."

It may be observed that Production No. 4 shows a proposed lay-out of the buildings different from that originally planned. The reorientation was made as a result of the views of the Ayr County Council Planning Officer, and of data from the borings, and also from soundings taken offshore. The proposed lay-out would enable the main two reactors and the turbine hall to be sited without preparatory delays and additional expense on rock foundations. The reactors would thus be at the same level over the 200 yards in length that they occupy, and there would be maximum economy in the foundation works. The turbine-house basement would also be at the correct level relative to sea level, giving the minimum of pumping losses.

The areas required for the main group of buildings are given under reference to Production No. 4: viz.—the two reactors, heat exchangers and cooling pond occupy 600 ft. by 170 ft.; the turbine hall, loading bay, control room and transformer bays occupy 672 ft. by 150 ft., marked numbers 3 and 4; the uranium and graphite store occupy 110 ft. by 170 ft., marked No. 9; the charging machine maintenance building, the graphite disposal plant, the control rod room and decontamination area occupy 480 ft. by 120 ft., marked Nos. 11, 12, 13, 14 and 15; the sewage disposal plant and water plant occupy 70 ft. by 170 ft., marked No. 16; the station workshop 70 ft. by 140 ft., marked No. 5, the vehicle hangar, repairs garage and fire station occupy 80 ft. by 130 ft., marked Nos. 7 and 8; and the switch compound about 900 ft. by 400 ft., labelled "switch compound".

A tongue of land running south along the foreshore from the main area, and extending to about 15 acres would accommodate the cooling-water intake pumphouse and tunnels.

Seaward, the rock conditions are suitable for the intake and outfall tunnels and headworks, while there is adequate depth of water at the intake and outfall points. At all states of the tide, an uninterrupted inflow of water, at low velocity, would be assured of the order of 18 million gallons per hour. The intake tunnel would be below the sea-bed. A break-water would probably be required, in the nature of a concrete structure, some 10 ft. above high water level, with, superimposed possibly, some necessary light plant to handle screens and the like. The inlet and outfall works would be separated by about two-thirds of a mile. At the outlet, the outflow of warm water would be quickly and effectively dispersed

at a distance remote from the intake. This outflow water should never exceed a rise of 15° over the temperature of the inlet water, and would be rapidly cooled some distance from the outlet. It would be continuously discharged at all states of the tide. So far as its radio-activity is concerned, it would, in the words of the Chairman of the R.L.P. bc, (if fresh, and not sea water), "fit to drink", and seaweed will not be affected by any minute increase of radio-activity, in particular for the purposes of gathering and spreading on farm land. The chlorine content would also be so small as not to affect fish or other sea life. The estimated chlorine content is 0.1 part per million at the outlet, which is indicated in the evidence as being less than the quantity normally used in ordinary drinking water from many reservoirs.

The outfall tunnels would extend, and their headworks would be situated, some 200 yards seaward from low water mark, at a point about 500 yards from the shore, opposite the station.

In full knowledge of the interest, and in some cases concern, evinced in some quarters as to any increase of the usual natural background of radio-activity, e.g. from such sources as X-rays whether in detection of disease or in shoe-fitting machinery, or even in the minute quantities emanating from luminous wrist-watches or television sets, the evidence given in these Inquiries by the only witness having the necessary knowledge and experience of this vital matter is that, in normal operation, this station will not in fact be harmful to man, bird, beast, fish, or plant. And controls are designed in succession to obviate the danger of the abnormal in its functioning. No one was in a position to counter his testimony as to the safety of the station. The reliability of the witness is patent, and his evidence in the circumstances may be accepted.

25. Access to the Site

The proposed access road to the Hunterston site is shown in yellow on the Site Plan, Production No. 4. It is some 2,600 yards in length. The carriageway is planned to be 24 feet in width with a 7 ft. 6 ins. verge on the seaward side for a public footpath, and a 5 ft. wide verge on the landward side for services, e.g. water pipes, telephone cables, etc. Outwith the proposed site area some 20 acres of land would be required, including a small amount of ground required in the early stages of construction to get the plant to the site. This land required is shown on the Compulsory Purchase Order plan, Production No. 28/2.

The road joins the main Largs-Ardrossan road at a point about 200 ft. north of the Hunterston drive entrance. This junction has the approval of the County of Ayr road authority and of the Scottish Home Department. It would "tie in" with a proposed widening scheme for the main road at the bend in the vicinity of the drive entrance.

The proposed route would seem to offer the access of least disturbance to the adjoining proprietors and occupiers and would minimise, as against alternative proposals, the element of severance of the estates. To these ends, the Board are prepared to accept the increased engineering difficulties involved, including a triple crossing of the north boundary burn between the estates of Hunterston and Southannan. In that area also, the route would occupy the minimum of arable land, by utilising an area of wooded scrub.

At the junction with the main road, it is necessary to take about 0.67 acre of arable land from Southannan Estate because of the tentatively approved position of the junction. The acquisition of the remaining ground of the

estate, coloured blue on Production No. 28/2, would be requisite and minimal, as some culverting and embankment work is envisaged. The small triangle of ground marked 945a(Pt.) is not now required.

The present farm entrance road to Poteath Farm will, however, be severed by the proposed new access road. This makes it necessary to provide a junction on to the new road at the point of crossover. For this purpose a turn in should be provided on the new road, with a gate, if desired, leading on to the remaining part of the old access road still to be used.

The felling of some 30 trees in the wooded scrub area would be necessary and proper. There would be no need to fell the trees bordering the drive to Hunterston.

Field No. 940 would reasonably be required from the Hunterston estate for the road construction.

From the point where it would finally cross the burn, the road would follow a line along the landward side of the existing fences and stone dykes the whole way until it enters the site at its north end. It may be that, subject to costs and/or engineering difficulties (e.g. because of apprehended sea damage) some portion of the road between Shore cottage and the entry into the site could be moved seaward and so further minimise the area of arable land required. This should be considered. The Board expressed a willingness within reason and the economics of the situation, to compromise with regard to this route or alternatives.

No serious suggestion was pressed at the hearings that the route should be other than as proposed, although one or two alternatives were adumbrated. Subject to amenity factors hereinafter mentioned, the route is appropriate and should give the minimum of severance and disturbance.

26. The Objectors

Objections or representations were received from 40 persons or bodies, including six owners or lessees of subjects affected or likely to be affected by the Board's proposals regarding Hunterston. One of the objections was collective, signed by 208 persons, some of whom had submitted separate individual objections included in the previous total.

The Inventory of Productions totals some 198 individual items, including the eleven volumes of the notes of evidence and speeches recorded during the original eleven days that the hearing of the Inquiries occupied, and the one volume of the evidence and speeches recorded at the second Inquiries.

In Appendix II, are the details of the Objectors. As regards the Compulsory Purchase Order, the original number of Objections was seven comprising individuals or bodies of trustees concerned as owners or occupiers of affected heritage or structures. These are all included in the original total of 40 given above. Of the seven, no land belonging to Mr. William Adams of Ardnail is now required. Of the remaining six, Mr. John Shedden is lessee of the Portencross sea salmon fishings not now to be acquired, and Mr. Alexander Sommerville is owner of a small holiday house or hut known as "Cumbrac View", Northbank, Ardnail Farm, also not now required by the Board. In the result there remain four separate Objections to the Compulsory Purchase Order, the principal Objectors being Miss Eleonora Hunter of Hunterston, and the Trustees for the Hunterston Estate. They together with the Trustees/Owners of the lands and Estate of Southannan and the Messrs. Robert and Neil McIntyre, lessees of Poteath Farm, are the persons whose lands are now directly affected by the proposals.

27. The Objections

The Objections lodged on behalf of the Proprietrix and Trustees of the Hunterston Estate and those lodged on behalf of the Trustees/Owners of the Southannan Estate are Productions Nos. 2/13, 2/14 and 2/15. They conveniently focus the views supported against the Board's Hunterston proposals.

The Hunterston estate has been in the keeping of the one family for some 600 years, which is a point special to those concerned to preserve the estate. There is also the particular point that the trustees are obliged under the terms of their trust to maintain the estate as an entity. In the wider field, however, the main points are :—

(a) Loss of Agricultural Land

The loss of very valuable agricultural land, which produces some of the first early potato crops, was stressed. These crops are produced in very limited areas of Scotland. On the Ayrshire coast, the area is confined to a narrow strip extending for some 50 miles from West Kilbride southwards to Ballantrae. The other Scottish areas are Wigtownshire and East Lothian. Close proximity to the sea, climatic conditions, the nature of the soil and freedom from storm and frost damage are the main features which are necessary to the successful production of first early potatoes. The site at Hunterston, including the shelter provided by Goldenberry Hill, provides these features. The annual acreage under first early potatoes would be about 25 acres.

The first earlies are lifted before the crop is mature. The yield is accordingly low. A good yield would be about 8 tons per acre. In the first few days of the market a price of £30 per ton may be obtained ; but after that the price may fall to about £18 per ton. When the potatoes are lifted at the earliest stage, it may be practicable to get a second cropping of the land. If the potatoes were allowed to mature, the yield per acre would be very much greater, albeit the price would be much lower. In the early part of the year potatoes are imported.

Of the 1,000 acres comprising the estate, about 690 acres are farmland. The Board seek to acquire 110 acres or thereby in addition to the foreshore. Of the 110 acres, about 50 per cent is arable. The foreshore comprises about 50 acres, some of which provides limited grazing.

Upon the evidence, the first early potato crop is a luxury rather than a necessity. The prices accord. This loss may be more cogent in a question of compensation than in these inquiries. The evidence also supports the view that while the two dairy herds, totalling 76 cows, would undoubtedly be disturbed during the constructional period, and half of that number may have to be dispensed with during that time, the estate with its three farms organised overall as one agricultural entity could still be efficiently run. There would be no severance approaching anything like a serious or crippling degree.

As far as Southannan Estate and Poteath Farm are concerned, there would be neither severance nor disorganisation of significance. The area sought to be acquired from that estate is about two and a half acres. The northern area of the estate, which is the area in issue, includes seven farms covering about 2,050 acres. Poteath Farm would lose about half an acre of arable land out of a total farm of 172 acres. Were the junction of the proposed access road with the main Largs-Ardrossan road to be moved further north, there would be a greater loss of good arable land to Poteath Farm. The representative who spoke for the Southannan Estate

proposed no alternative route. If the proposed route be approved, there would seem to be no more suitable route.

(b) Danger from Radio-active Fumes, etc.

Great anxiety was evident in the Objections, and in the evidence, as to the dangers arising from the operation of the station. In particular there are fears as to the effect of radio-active dust and fumes as affecting man, bird, beast, plant, fish and sea life. These include the grazings and the milk produce of the dairy herds. Miss Hunter has serious and genuine concern as to the effect of the station and its radio-active elements upon her employees living and working in the immediate vicinity of the station, and upon the products of the farm. The evidence in the deeply considered, responsible opinion of those who alone have the knowledge, experience and classified records to speak from, given through the Chairman of the Reactor Location Panel, is that in all these respects the station is safe. The matter is dealt with above. This aspect would also accordingly seem unlikely to affect the tourist industry adversely, which was another point taken.

Isolation is approved by the R.L.P. The position is, therefore, that danger or harm to individuals or to any concentration of inhabitants, particularly so distant as Glasgow, is not to be reasonably anticipated.

(c) Alternative Sites

Antecedent conscientious canvass of all appropriate alternative sites, before taking final steps with regard to one, was very strongly urged. This matter has been covered.

The proprietors and trustees of both estates also fear that the proposals by the Board constitute only "the first bite of the cherry". Expansion is not contemplated; but doubtless the Chairman of the Board was right when he found himself unable to give any guarantee of no future expansion. It would of course be wrong of the Board to proceed on the basis of an undisclosed but presently contemplated expansion. There is no suggestion of this in the evidence.

(d) Rights of Way

Loss of public rights of way is also apprehended. The Board's representatives undertook to safeguard these and when necessary to give substitute routes. There is no need, nor intention, to destroy these rights.

(e) Foreshore and Foreshore Rights

There was throughout the greater part of the proceedings considerable doubt as to the persons or body in whom the foreshore was titularly vested. Production No. 69A, however, includes an intimation from the Crown Estate Commissioners dated 28th March, 1957, that "they have decided on behalf of the Crown not to contest further Miss Hunter's claim to ownership of the foreshore between high and low water marks of ordinary Spring tides *ex adverso* the Hunterston Estate." They point out that any construction work on the sea-bed below low water mark of ordinary spring tides, which is still the property of the Crown, will require a Servitude of Wayleave in respect of the Crown's proprietary rights and interests.

The Board's need of the foreshore is to accommodate plant and equipment necessary for the construction work on the project, and, in particular, for the construction of the intake and outfall tunnels and headworks. It is proposed also to take equipment to the site by sea in "DUKWS". The

foreshore area would be used in addition to safeguard persons from blasting operations. Areas of it may continue to be required for maintenance and repair work. The need is established.

(f) Severance of the Estate

This matter has been referred to. The restricted requirements, while undoubtedly having some adverse effect both upon the administration and economics of the estate, would not be of such degree as to warrant rejection of the Board's proposals, if otherwise approved. The economics of the situation are no doubt a factor for consideration in any assessment of compensation.

(g) Damage to Roads

In their answers, Production No. 3/1, the Board stated that existing estate roads would not be used except by arrangement with the proprietrix. This should be so. The proposed access route when made would be designed to carry all the ingoing and outgoing traffic. The existing estate roads at Hunterston would be used neither during construction of the station nor afterwards, subject of course to the proprietrix agreeing otherwise in particular instances. The traffic would include some very heavy indivisible loads which the estate roads are certainly neither designed nor constructed to accommodate. Field 940 of Hunterston Estate shown on Production No. 28/2 would be used for traffic until a rough track were made. That would probably be for a period of three months. It is estimated that the access road would take about six months to construct.

(h) Effect on Areas of Ornithological and Other Interests

The coastal area, part of which would house the station, is of ornithological and possibly of botanical and geological interest. Hunterston Estate is included in the Development Plan of the Ayr County Council as "an area of great landscape, scientific, architectural or historic value". That area, however, extends from Skelmorlie to just north of Ardrossan. The Development Plan which comprises Productions Nos. 30/1, 2 and 3 has not yet received approval, but is certainly indicative. Hunterston and Portencross Castles are scheduled as Ancient Monuments but have not been taken over by the Ministry of Works.

Danger of radio-activity affecting bird life may be discounted. It may be accepted that persons from, for example, Glasgow do resort to the area, and to the foreshore of the district, for study of bird life and in search of botanical and geological or other interests. Some measure of disturbance is inevitable during the period of construction. The evidence is to the effect that the Board has no intention of preventing or restricting legitimate access for the foregoing interests, within limits dictated by the security of the plant itself. As stated also, recognised existing rights of way will not be destroyed nor obliterated without in any event a substitute way being provided in the close vicinity, thus maintaining existing access for these interests.

(i) Disturbance

There is bound to be considerable disturbance in the area of the site during the constructional period. Details of the estimated labour force are given in paragraph 20. In addition blasting operations will be necessary, as also the accommodation and movement of heavy plant and equipment, together with the prefabrication on the site of very large parts of the reactors, etc. The evidence is that minimal areas of ground have been taken for the work, but that there will not be a construction camp on the site

and that the activities and labour force will be confined to the proposed areas and access route. Disturbance must be accepted, but it is proper that the activities and labour force should be strictly controlled and that these matters should not be mere lip service to the rights of the adjoining proprietors and occupiers. They are entitled to be safeguarded.

(j) War Target

Several of the Objectors who were not represented were apprehensive that the station might be attractive as a target, and that its proximity to the I.C.I. Explosives factory was undesirable. The points were not followed up in evidence. No doubt national policy and strategy have these matters in view. This station is at present unique, but the contemplated programme of additional stations will probably soon relegate the type to the commonplace, and lead to a "spread over". No view is practicable upon the evidence led. The point sought to be made is possibly that devastating as hydrogen bombs or the like may be, their effect upon the reactors with the release of the radio-active contents would in the result be cataclysmic, not least upon the Glasgow area.

(k) The Effect upon Fish and Fisheries.

As stated earlier, it may be accepted that no damage from radio-active discharges of any kind may be apprehended so far as fish are concerned. For salmon fishery purposes, the sea *ex adverso* the estate, and north and south of it, is outside the Clyde estuary limits.

It is clear that the intake and outfall works proposed would practically obliterate any salmon fishing there may be immediately opposite and contiguous to the Hunterston estate. This is essentially because of the physical interference to fishing caused by the works.

Except under certain conditions, and right at the mouth of the outfall tunnel, the warm water would not affect fish. Stratification of warm and cold water would not occur in the moderate continuous off-shore current.

Expert evidence was given by the fisheries adviser to *inter alios* the North of Scotland Hydro-Electric Board. It may be accepted that the proposed sea works would not affect the salmon or sea trout or other fish to the immediate south of the Hunterston estate foreshore, nor is interference with the run of the fish probable. Lobster fishing is also unlikely to be affected in any way.

Screens, however, are advisable round both the intake and outfall tunnels.

It will be recalled that the original intention to acquire both land at Ardneil, Portencross, and the salmon fisheries there, was abandoned.

(l) Traffic

During the construction period there will undoubtedly be increased traffic on the main Largs-Ardrossan road. Occasionally "large indivisible loads" will be brought along it. There is nothing to substantiate however any significant degree of dislocation to the normal flow of traffic on that road.

(m) Agricultural Labour Force

Some objectors feared that the proposed works would draw off the already not too plentiful labour force. This matter was not explored in the evidence.

(n) Depreciation of Land Value

This aspect, again brought forward by *inter alios* one or two non-compearing objectors, was not canvassed in the Inquiries. If the station would have this effect upon the lands and heritages of adjoining proprietors or occupiers, it would seem to be a matter for another *forum*. The point is appreciated, but lacks such force as would sway a decision upon the main issue.

(o) Amenity

This is an aspect of great importance and was urged not only by very many of the Objectors, but was explored very fully indeed in the evidence.

Basic to the Objectors' criticisms was the point that although the Board has an Amenity Committee established under Section 9 of the Hydro-Electric Development (Scotland) Act, 1943, and has available the services of the Royal Fine Art Commission for Scotland, none of these were consulted before the Board's final decision was made that Hunterston was the most appropriate site for the project. That criticism is well-founded, albeit the 1943 Act refers to "the generation of electricity by water power". The Board's chief planning consultant inspected the site only one week before the original Inquiries started, and that was purely with a view to giving evidence, while the consulting architect to the Board first heard of the scheme about Christmas, 1956. He was indeed only consulted within the last month before the parties joined issue in evidence. "Off the record", as he said, he would have desired earlier opportunity to consider the whole situation and advise. It is a little ironic in the particular circumstances to find that he has the invaluable experience of being a member both of the Board's Amenity Committee and of the Royal Fine Art Commission for Scotland, with exceptional qualifications which well equip him to advise on amenity and the harmonising of building and site.

This inversion of what might be considered appropriate procedure is focussed by the inevitable concession of the consulting architect in cross-examination that he was "called in to advise upon a predetermined building to be placed on a predetermined site". It adds power to the already forceful comment by the Dean of Faculty, in his closing speech, that the Board might be said to have failed primarily to establish the fundamental proposition that it "is good planning to zone this, the first nuclear generating station, at Hunterston",—applying the concept of the Town and County Planning (Scotland) Act, 1947.

While appreciating the strength and aptness of the point, however, if it were given full effect it would be tantamount to ending the issue upon a preliminary plea, sustained after an elaborate proof. That drastic step is not justified in all the circumstances, although it has given cause for real concern; not least when the Turnberry site, from the civil engineering point of view, so closely rivals the Hunterston site.

It will be recalled, however, that the contract for the station was a "packaging operation". The Group contractors were obliged to tender for a station designed by themselves. In fact, the Group's executive architect for the proposed station had arduously and most conscientiously collaborated on the design of the building for some eight or nine months on end. In addition, the design was to a great extent governed by functional requirements. The tenders were invited too on the basis of the station being required for a typical, and not a particular, site. Design inevitably was not correlated to any physical situation. Further the station

is silent in operation and lacks the familiar smoke, dust and sidings of the usual industrial factory, features which tend to obscure the need still to consider amenity.

In this new field accordingly, with its exploratory elements, while the inversion of procedure adverted to may be regretted, it is not unintelligible. The Atomic Energy Authority, through the Reactor Location Panel, was final upon isolation, and solely able to judge upon technical or functional design in the context of safe and efficient operation. In fact, approval of a site by the Reactor Location Panel must antecede any other step for sanction to proceed. Design, further, was for the Group contractors. Urgency was stressed in high policy. These various factors are sufficient to explain the Board's actings. They may also, however, serve as a guide to procedure for future projects, particularly on the architectural and planning sides. Choice of a site must include the planning approach, as against the purely constructional or strictly architectural aspects, as an essential preliminary. As was well said by the expert planner for the Objectors, it should not be a case of the engineers saying "there's a site, see what you can do with it," but the architectural adviser should "sit in" with the engineers to consider the various probable sites. This would achieve a "better overall balance". Amenity, both public and private, in this particular case has a very great value and merited the most anxious consideration.

It is essential to bear in mind the enormous height and mass of the main station buildings. They were aptly characterised in evidence as "enormous", or "tremendous". Details have already been given. Production No. 61/1 to 4 is illuminating. It shows in silhouette the proposed two reactors and turbine hall, in comparison with silhouettes to scale of the Portobello Power Station, the new National Library in Edinburgh and St. Andrew's House. They dwarf each of these. They are of greater mass and proportions than anything of which we have experience in the United Kingdom. There are no hydro-electric schemes which have power houses of this scale.

On the other hand it is very important to observe that all the planners and architects were at one that the proposed exterior design of the buildings is very fine indeed. The cladding of the main components as proposed, would be carried out in transparent and translucent glass, with patent lead covered glazing bars. A brick plinth, right round the main building, would be of appropriately coloured brick; and the roofs, which would be seen from some more distant, high vantage points, would be finished in a mineralised felt, or the like, of a green colour. The intention would also be to utilise indigenous stone. These methods would in effect reduce the bulk of the reactors. It is contemplated by the Group architect that the use of glass would give the mass "a lightness and a quality which make it appear as though the building floats away"—that is, apparently!

The consensus of expert views then is that this is "a magnificent building of its type".

And no one could counter the fact that Hunterston Estate, with its promontory and the Goldenberry and Campbelton hills, is on one of the finest and most world famous stretches of the Clyde; indeed is a feature of it. The view across to the Cumbracs and the peaks of Arran, or along this coast, is rightly spoken of in the evidence as "absolutely magnificent". While the Hunterston Estate is but one of the several very fine sites in the area, it itself has "great character".

In this context, it was obvious that the experts taking into account the great mass of the buildings were most anxious, so far as possible, to eliminate silhouettes of the two reactors and turbine hall which would destroy the very real beauty of the landscape. There is no doubt that the vital point from the amenity aspect is that the natural silhouette of the hills and promontory should not be violated. No one competent to testify in this respect sought to gainsay the point.

The result of the evidence is undoubtedly to the effect that if the whole complex could be moved a little, the siting at Hunterston could probably be acceptable, assuming the site to be otherwise justified.

It seems to be an inescapable inference, also, that if the Board's expert advisers on this aspect had had the opportunity to consider the matter fully beforehand they would have urged that this move be most seriously considered and, if practicable, be effected. In such time as had been available to them, they thought that the mass would not, from important vantage points, "cut the skyline". But as a result of inspection of the sites, and viewing the locus from various directions, as also with the aid of Production No. 76 (the conjoined eight Ordnance Survey Map Sheets), it is beyond dispute that from well-known viewpoints, frequented by the public and tourists, the buildings will obtrude into the skyline. Such vantage points include Largs Monument and Haylie Brae, Fairlie Pier and Larbert Cottage, Fairlie, as also the hill road to Dalry, inland from Hunterston. From the latter position, a truly magnificent view across the Firth of Clyde to the Isle of Arran will undoubtedly be in part obliterated by the buildings. The artist's impressions, Productions No. 56/1 & 2, although not entirely accurate, are indicative.

Goldenberry Hill is only some 458 ft. high; and the height of Campbelton Hill is about 245 ft. The actual height of the reactors is 202 ft., increased of course by the height of the foundations above sea level.

Private amenity is heavily in issue too. Without question, the views from Miss Hunter's house will be adversely affected. This is particularly so with regard to the very fine view to the south-west across to Arran, from the drawing room and the observation room above it. Production No. 60 helps to understand this, as also do the photographs, Production No. 54.

In considering the alternative sites from the amenity point of view, the experts performed a seeming *volte face*. After all the combined efforts to merge the massive structures into the rather intimate, physical and aesthetic features at Hunterston, they considered that at Turnberry the tremendous buildings would stand out, clear of everything else, on level ground and be seen either in all their inherent magnificence,—or "like a sore thumb". Those most directly concerned, if Turnberry were to be the site, were not represented at the Inquiries, so those vastly differing conceptions may be allowed meantime to be unresolved.

If the reactors were moved back towards Goldenberry Hill, difficulties may arise because of differing ground levels between the reactors and the turbine hall. The cost may be of the order of £400,000.

If such a move were practicable, the cost may be justifiable in all the special circumstances. The Board indicated that the move is virtually impracticable, but this may be because they felt such an increased cost for amenity could not be justified at their own hands.

Such additional cost may well be justified in safeguarding this superbly fine stretch of coast and island scenery. It would still leave a balance of

cost, as between Turnberry and Hunterston, of something like £1 million favourably to the latter site. This saving is, of course, in respect of transmission costs.

It is impressive that none of the neighbouring local authorities have pressed objections to a conclusion.

Ayr County Council and Largs Town Council are NOT among the Objectors. Millport Town Council lodged an objection, but do not now object in principle to the siting of the station at Hunterston. These are public representative bodies, concerned no doubt to weigh the pros and cons of this project on behalf of their constituents, and zealous to safeguard the tourist value of the area. The site falls within the ambit of the County's Development Plan. The Millport Town Council do, however, with good reason (because of the possible detriment to the view from that holiday resort), wish to be kept in touch with the decisions taken "as to detailed siting and architectural features of the station and the positioning of the transmission pylons and cables". They urge that the initial stages of the power lines should be underground. This last point, upon the evidence, is claimed by the Board's engineers to be impracticable, fundamentally for technical reasons, but also because of the great cost per mile. As against the cost of overhead transmission of about £26,000 per mile, to put the necessary two sets of cables underground would be of the order of £160,000 per mile.

The fundamental technical reasons against putting the cables underground were neither detailed nor countered in evidence. They may no doubt be accepted as valid.

The position of the pylons has not been decided upon. Again, all the witnesses concerned with amenity agreed that the siting of the pylons and transmission lines is of very great importance indeed. They could be seriously detrimental to amenity. However the siting of these so as to avoid breaking the skyline seriously, if at all, is a problem which apparently can be reasonably solved at the Hunterston site.

Much criticism was directed against the Board for not *ab ante* deciding upon the position of the pylons and cables. If in future their amenity adviser is brought in at an early stage, it should be practicable to deal with this aspect at the same time as consideration is being given to the siting of the buildings harmoniously with the proposed site or sites. The matter has agricultural significance too, for pylons sited on arable land can involve more loss of land and difficulty in cultivation; factors to be kept clearly in view by the Board, as was *inter alia* urged by the National Farmers' Union Executive for the Ayr area.

The use of trees, to assist amenity from the public and private points of view, is a matter which the Board have fully before them. It affects the transmission apparatus problem too. The expedient should be used.

The Fairlie Citizens' Association has no objection in principle to the project at Hunterston, but raised some of the other issues mentioned later.

The Association for the Preservation of Rural Scotland objected chiefly because they felt the Board had adopted a *fait accompli* attitude and seemed to regard the Inquiries as mere matter of form. Perhaps this report may allay the latter apprehensions. The matter is too time-consuming and anxious to be a formal exercise. This Objection is particularly useful as indicating the great importance of the Board's public relations. The need for a station was accepted in principle by the Association, and they were

open to conviction that the site selected is the only one meeting all the technical requirements.

The Glasgow Branch of the Scottish Ornithologists' Club, and the Objection lodged on behalf of 208 individuals, referred to above, were the only other representative groups. The latter feared that the project would be "detrimental to amenity, safety, agriculture and fishing". Matters affecting both these bodies have been considered earlier in this report.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Consent may properly be given in principle to the application under Section 2 of the Electric Lighting Act, 1909, as amended, to the construction of a nuclear generating station mainly on Hunterston Estate, in terms of the application by the South of Scotland Electricity Board.

2. Planning permission for the construction of the said nuclear generating station on that site, and for the access thereto, may also properly be given; but, it is respectfully suggested subject to the conditions or recommendations undernoted.

3. The South of Scotland Electricity Board (Hunterston) Compulsory Purchase Order, 1956, may properly be confirmed, subject to the exclusion therefrom of the small triangular area of field numbered "945a" part of the farm of Poteath included in the plots of land numbered 5 in the Schedule annexed to the said Compulsory Purchase Order; and also excluding therefrom the whole plots of land and salmon fishings being part of the farm of Ardnell and the sea fishings *ex adverso* thereof, numbered 6 to 8, both inclusive, in the said Schedule. The said field numbered 945(a) is coloured blue on the map, Production 28/2, referable to the said Order. All the other said plots of land are coloured green on that map.

Recommendations and Legal Considerations

Under reference to Production No. 67, the "Memorandum of Undertakings by the South of Scotland Electricity Board", Appendix V to this Report, the following recommendations are made:

1. The Siting of the Station

The precise siting of the station on the areas to be compulsorily acquired and the architectural features, should be the subject of discussion with the Amenity Committee of the Board and with the Royal Fine Art Commission for Scotland. This is to ensure that within the reasonable practicability of the engineering aspects and the reasonable economics of the situation, the detriment, if any, to amenity, both public and private, shall be minimised. A shift of the foundations of the main buildings somewhat to the east and to the south would probably be best for amenity. In the transcript of evidence, pages 349, 488, 511 and 802 refer. At least during the Inquiries, the Board felt unable to agree to such a shift.

2. The Pylons and Transmission Cables and Switch Compound

These should also be sited in consultation with the Amenity Committee and/or the Royal Fine Art Commission for Scotland. Both public and private amenity are involved. Tree planting as a useful screen merits consideration.

3. The Access Route

- (a) The access route, particularly in so far as it passes in front of the main entrance to Hunterston House, should be considered by the Amenity Committee. All practicable steps should be taken by way of tree-planting, landscape gardening, dyking or the like to safeguard private amenity ;
- (b) If practicable, and conforming to efficiency and reasonable maintenance prospects, the route between Shore Cottage and the entrance to the station on the north might be moved slightly seawards to minimise the loss of arable land.
- (c) Paragraph 2 of the said Memorandum may be accepted. It is appropriate that the access road, subject to the rights of way, should be for the private use of the Board, but it should be opened at stipulated times for public vehicular access. Regulations and times for opening should be the subject of reasonable prior discussion with the proprietrix of Hunterston Estate. To prevent the road becoming public in use, the proposal recorded at page 734 of the transcript that a gate with a pedestrian access should be provided, presumably after the station is completed, seems reasonable.

It is obvious that the security of the station should be a primary consideration. The immediate precincts of the station will, of course, be enclosed in a security fence. Car parking and turning places will be required.

- (d) Paragraphs 6 to 11 both inclusive of the Memorandum seem to provide adequate safeguards for the interests of proprietors and others. The road should be fenced so far as necessary to meet the above requirements of the adjoining proprietors. Those proprietors, their tenants and their tradesmen, visitors and the like must have access to their houses and lands along the route as necessary.

It may be noted that at the conclusion of the Inquiries the Objectors represented had no modifications to suggest to the Memorandum. To prevent trespass on the adjoining land to the south of the area of acquisition, it is recommended that the pumphouse area be enclosed by a fence.

4. Rights of Way

There are apparently two: one from Hunterston Gate towards Portencross via Hunterston Drive, and the other from Fence Bay in the direction of Portencross.

These must be preserved, subject to the minimum necessary intermittent interruption and temporary deviation while construction work is in progress. Where substitute routes are necessary those must be provided. This subject should be matter of discussion and arrangement between the Board and the Ayr County Council. Paragraphs 3, 4, 5 and 11 of the Memorandum, under reference to its annexed plan No. N/68, seem acceptable.

5. Foreshore

This area is required for purposes of control and use during the period of construction. Thereafter, the Board will require it only where the intake and outfall pipes run, and for maintenance or replacement purposes of the tunnels and headworks, etc. It should be matter for mutual arrangement between the Board and the proprietrix whether or not the foreshore area not ultimately required be reconveyed to her, subject to any necessary wayleaves.

6. Reinstatement of Ground

It is estimated that the ultimate area occupied by the station will be about 40 acres. Reinstatement and reconveyance, or otherwise, of land not required after construction is complete could appropriately be left to mutual arrangement between the Board and the proprietors concerned.

7. Fisheries

In consultation with the Scottish Home Department and, in any event, with the Fisheries Committee, any necessary precautions should be taken to safeguard fisheries. Appropriate safeguards would be the provision of screens round both the intake and outfall tunnels, and adequate checks, by samples and measurement, of the intake velocity, the outfall water temperature, and the chlorine content, and (particularly) the radio-activity, of the outfall water. In future cases the Board should consult the Fisheries Committee at an early stage.

8. Nuclear Safety

- (a) In public concern, as also of the proprietrix of Hunterston Estate, this is probably still the most doubted factor. It would seem entirely proper that the monitoring instruments, their siting and correctness, and the records derived from them should be subject to stringent independent check.

The farm dwellings of Fences and Goldenberry are close to the actual station. They are well within the third of a mile limit designated by the Chairman of the R.L.P. The occupants are entitled to every assurance and safeguard.

Not least important in this respect is the legal position. Under the Atomic Energy Authority Act, 1954, which applies to Scotland, it is provided by Section 5 (3) that "it shall be the duty of the Authority to secure that no ionising radiations from anything on any premises occupied by them, or from any wastes discharged (in whatever form) on or from any premises occupied by them, cause any hurt to any person or any damage to any property, whether he or it is on any such premises or elsewhere".

Section 5 (4) provides *inter alia*, in its application to Scotland,—
"as respects waste discharged (in whatever form) on or from any premises occupied by the Authority—

"(a) no radio-active waste shall be discharged otherwise than in accordance with authorisations to be given by the Secretary of State, after consultation, in each case, with such local authorities, river boards, local fishery committees or other public or local authorities as appear (to him) to be proper to be consulted by him".

These authorisations may be given subject to compliance with such "conditions and requirements" as the Secretary of State thinks fit: Section 5 (4) (b).

In terms of section 5 (4) (c) the Secretary of State may authorise persons "to enter and inspect" premises occupied by the Authority, to sample waste discharged or awaiting discharge, to ascertain whether stipulated conditions or requirements are being breached.

It is essential to observe that these provisions and powers pertain with regard ONLY to the Atomic Energy Authority, and NOT to the South of Scotland Electricity Board, nor to any other Electricity Board.

In the course of the Inquiries, the Board's Chairman very properly conceded that the activities of the Board in the use and exploitation of nuclear energy shall be subject to these same stipulations and requirements. He rightly regarded this as "inescapable".

It would seem imperative that as nuclear energy is now being rapidly developed as a source of industrial power, legislation should be effected to match the duties and responsibilities of bodies, such as the Board, with the potentialities of the fuel and processes used.

Acceptance of requirements for inspection, sampling, and checking, directly in accord with the said powers in the 1954 Act, should be made express conditions of consent to the construction of this station.

NO slackness or negligence can be tolerated with regard to the exhaust of gases into the air, or the discharge of radio-active cooling water or waste into the sea; nor in the treatment and removal of the spent fuel. The potentialities are too grave.

Related to this matter was an argument in law submitted by Mr. Campbell for his clients, which merits close consideration.

- (b) Mr. Campbell in his closing speech during the original Inquiries, which he adopted in the present Inquiries, stressed the concluding views expressed by the Medical Research Council in Production No. 37/2—"The Hazards to Man of Nuclear and Allied Radiations". In effect these indicated, he urged, our continuing ignorance in far too many respects of the future effects of additional radio-activity resulting from nuclear fission: and unquestionably their principal conclusion is the absolute necessity of avoiding all possible extra radiation and/or restraining its use.

These points are warranted by paragraphs 355, 356 and 358 of that booklet. Paragraph 355 states—"Our present knowledge does not justify us in naming any specific figure as a limit for the average dose of radiation which might be received by the population as a whole. It is highly desirable that such a figure should be named as soon as possible; and we understand that the International Commission on Radiological Protection has this matter under consideration. In the meantime, we feel bound to state our opinion that it is unlikely that any authoritative recommendation will name a figure for permissible radiation dose to the *whole population*, additional to that received from the natural background, which is more than twice that of the general value for natural background radiation. The recommended value may, indeed, be appreciably lower than this". Paragraph 356 includes "The risk from civil usage is at present small, and seems unlikely ever to be large; but from the point of view of population genetics all possible extra radiation should be avoided, and it is not now too early to suggest where we might restrain its use." Paragraph 358 states—"We consider that the time has come for a review of present practice in diagnostic radiology, and of certain uses of radiation in the treatment of non-malignant conditions, particularly in children. Among the less important sources of radiation, we hope that the use of X-rays in shoe-fitting will be abandoned except when prescribed for orthopaedic reasons; that watches and clocks with radio-actively luminous dials will be confined to necessary uses; and that the X-ray hazard from television tubes, at present negligible, will be borne in mind if special types of high voltage equipment come to be widely used".

APPENDIX I

PUBLIC LOCAL INQUIRIES

Held in Barrfield Pavilion, Largs on 4th June, 1957

List of Parties Represented, and Representations

1. COMMISSIONER

Mr. Harold R. Leslie, M.B.E., T.D., Q.C.,
 Sheriff of Roxburgh, Berwick and Selkirk.

<i>Parties</i>	<i>Counsel</i>	<i>Solicitors</i>
2. PROMOTERS		
South of Scotland Electricity Board.	Mr. A. Thomson, Q.C., The Honourable H. S. Keith, Advocate.	Messrs. Shepherd & Wedderburn, W.S., 16 Charlotte Square, Edinburgh, 2.
3. OBJECTORS		
(1) Miss E. Hunter of Hunterston.	Mr. C. W. Graham Guest, Q.C., Dean of the Faculty, Mr. C. H. Johnston, Advocate.	Messrs. Thomson, Dickson & Shaw, W.S., 1 Thistle Court, Edinburgh, 2.
(2) Trustees for the Hunterston Estate—Ian D. Ross and Charles T. Reid of Messrs. Thomson, Dickson & Shaw, W.S.	do.	do.
(3) National Farmers' Union, Ayr Area Executive Committee.	do.	do.
(4) Scottish Landowners' Federation.	do.	do.
(5) The Earl of Eglinton & Winton, the Viscount Kelburn and Ian Donald Malcolmson, Trustees/Owners of the lands and Estate of Southannan.	Mr. W. I. Stewart, Advocate.	Messrs. Blair & Cadell, W.S., 19 Ainslie Place, Edinburgh, 3.
(6) William Adams, Ardnell Farm.	—	Mr. J. Campbell, W.S., of Messrs. Jas. Campbell, & Co., W.S., Bank of Scotland Buildings, Saltcoats.
(7) Robert B. McIntyre and Neil McIntyre, Poteath Farm	Mr. W. I. Stewart, Advocate.	Messrs. Blair & Cadell, W.S., 19 Ainslie Place, Edinburgh, 3.
(8) Alex. B. Allan, South Cottage, Portencross.	do.	Messrs. Hunter, Harvey, Webster & Will, W.S., 7 York Place, Edinburgh.
(9) Mrs. E. Caldwell Ker, Whinhurst, Portencross.	do.	Messrs. Anderson, Fyfe and Littlejohn & Co., Solicitors, 201 West George Street, Glasgow.

APPENDIX II

List of Objectors

<i>Objector</i>	<i>Address</i>
Mrs. J. H. Alpine	Netherlaw, West Kilbride, Ayrshire.
Air Commodore Ian R. Parker ...	Little Cumbrae Island, near Millport, Isle of Cumbrae.
H. T. Lawson, Esq.	Bute Terrace, Millport, Isle of Cumbrae.
Miss Margaret and Miss Winifred Adams.	Portencross, Ayrshire.
Millport Town Council... ..	The Town Clerk, Garrison House, Millport.
N. S. Davison, Esq.	West Cottage, Portencross, Ayrshire.
Fairlie Citizens' Association ...	The Hon. Secretary, Planetree, Main Road, Fairlie, Ayrshire.
William Adams, Esq.	Portencross, Ayrshire.
W. H. Cooper, Esq.	Winterseeds, Grasmere, Westmorland.
Major D. Hay Thorburn, D.L. ...	Creich, Fairlie, Ayrshire.
W. G. S. de Renzi, Esq.	18 Corsehill Drive, West Kilbride, Ayrshire.
Association for the Preservation of Rural Scotland.	The Organising Secretary, 15 Rutland Square, Edinburgh.
Miss E. Hunter of Hunterston, West Kilbride.	Messrs. Thomson, Dickson & Shaw, W.S., 1 Thistle Court, Edinburgh, 2.
Trustees for the Hunterston Estate — Ian D. Ross and Charles T. Reid.	Messrs. Thomson, Dickson & Shaw, W.S., 1 Thistle Court, Edinburgh, 2.
Trustees of the lands and Estate of Southannan.	Messrs. Blair and Cadell, W.S., 19 Ainslie Place, Edinburgh, 3.
Miss K. A. K. Cochran-Patrick	Hunterston, West Kilbride, Ayrshire.
Miss M. H. K. Cochran-Patrick	Hunterston, West Kilbride, Ayrshire.
Sir Neil J. K. Cochran-Patrick, K.B.E., D.L., J.P.	Hunterston, West Kilbride, Ayrshire.
Messrs. Robert B. and Neil McIntyre.	Poteath Farm, West Kilbride, Ayrshire.
Miss A. G. Cowper	6 Mountcastle Terrace, Edinburgh, 8.
H. Alexander, Esq.	Shore Cottage, Hunterston, West Kilbride, Ayrshire.
Miss Helen M. Baker	Hunterston, West Kilbride, Ayrshire.
Miss N. Hopkinson	33 Wootton Road, Finchfield, Wolverhampton, Staffs.
Miss H. McConnochie	Hunterston, West Kilbride, Ayrshire.
John Renton, Esq.	Campbelton Farm, West Kilbride, Ayrshire.
Miss J. Alexander	27 Cowdenhill Circus, Glasgow, W.3.
Miss J. B. McNee	Kinningbrue, Seamill, West Kilbride, Ayrshire.
Miss M. E. Percy	Yonderfield, Portencross, Ayrshire.
I. M. Percy, Esq.	Yonderfield, Portencross, Ayrshire.
O. Wardrop, Esq.	Drummilling Farm, West Kilbride, Ayrshire.
208 "persons interested in the area."	Miss Winifred Adams, Portencross, Ayrshire.
Ayr County Council	The County Clerk, County Buildings, Ayr.
National Farmers' Union, Ayr Area Executive.	The General Secretary, 17 Grosvenor Crescent, Edinburgh, 12.
Alexander Brander Allan, Esq.	Messrs. Hunter, Harvey, Webster & Will, W.S., York Place, Edinburgh, 1.
Mrs. E. Caldwell Ker	Whinhurst, Portencross, Ayrshire.
Glasgow Branch of the Scottish Ornithologists' Club.	Professor M. F. M. Meldejohn, Glasgow University, Glasgow, W.2.
John Shedden, Esq.	Castle Cottage, Portencross, Ayrshire.
Alex. Sommerville, Esq.	30 Sheepburn Road, Uddingston, Glasgow.
E. A. Gurney-Smith, Esq.	Thorn Cottage, 14 Vine Avenue, Sevenoaks, Kent.
Mrs. M. B. Macfarlane... ..	Carlung, West Kilbride, Ayrshire.

APPENDIX III

List of Witnesses

- DAVID WILLIAM TOLLEY ANGWIN, B.Sc., A.C.G.I., Chief Engineer (Construction) for the Atomic Energy Department of the General Electric Co. Ltd.
- LESLIE HAROLD BAKER, B.Sc., M.Inst.C.E., Partner in the firm of James Williamson & Partners, Chartered Civil Engineers, Glasgow.
- WILLIAM HEATON COOPER, Professional Landscape Artist.
- PAUL THOMAS FLETCHER, B.Sc., M.Inst.C.E., M.I.E.E., M.I.Mech.E., Deputy Director of Engineering of the Industrial Group of the Atomic Energy Authority; Chairman of the Reactor Location Panel.
- CHRISTOPHER EDWARD GRAHAM, Farmer, Chapel of Logan, Canonbie, Dumfriesshire.
- JOHN JAMES MILLER HANNAH, Farmer, Girvan Mains, Girvan, Ayrshire.
- ANDREW GRAHAM HENDERSON, F.R.I.B.A., Senior Partner of the firm of John Keppie & Henderson and J. L. Gleave, Architects, Glasgow.
- JOHN HENDERSON, M.C., B.Sc., A.R.T.C., M.I.E.E., Chief Engineer of the South of Scotland Electricity Board.
- Miss ELBONORA HUNTER of Hunterston, Ayrshire.
- EDWARD HYWEL JONES, M.I.E.E., M.I.Mech.E., Deputy Chief Engineer (Generation) of the South of Scotland Electricity Board.
- GEOFFREY F. KENNEDY, M.A., M.I.Mech.E., M.I.E.E., A.M.I.C.E., Partner in the firm of Kennedy & Donkin, Consulting Engineers, London.
- HOWARD V. LOBB, C.B.E., F.R.I.B.A., Senior Partner of the firm of Howard V. Lobb & Partners, Architects and Town Planning Consultants, London.
- ROBERT GARDNER-MEDWIN, F.R.I.B.A., F.R.I.A.S., M.T.P.I., Roscoe Professor of Architecture in the University of Liverpool.
- JOHN MEEK, Solicitor, Secretary of the South of Scotland Electricity Board.
- WILLIAM JOHN MILNE MENZIES, F.R.S.E., Fisheries Adviser.
- ALEXANDER TREVOR MCINDOE, M.T.P.I., A.R.I.C.S., N.Inst.H.E., Town Planning Consultant, Edinburgh.
- JOHN SIDNEY PICKLES, B.Sc., M.I.E.E., Chairman of the South of Scotland Electricity Board.
- JAMES REED, B.Sc., M.Inst.C.E., M.I.Struct.E., M.Inst.W.E., F.R.S.E., Senior Partner of the firm of Blyth & Blyth, Consulting Engineers, Edinburgh and Inverness.
- JOHN RENTON, Farm Manager of Hunterston Estate.
- Mrs. ISABELLA RAESIDE MACKIE, Factor of the Southannan Estates.
- JOHN HORACE WOOLLARD, Soils Engineer with John Laing and Sons Ltd., Building and Civil Engineering Contractors, Borehamwood, Hertfordshire.

APPENDIX IV

Dates of Public Hearings

The Hearings in the first series of Inquiries were held before the late Sir James Randall Philip, O.B.E., Q.C., in Barrfields Pavilion, Largs on the 29th, 30th and 31st days of January, and the 1st, 4th, 5th, 6th, 7th, 8th, 12th and 13th days of February, 1957.

The Hearings in the second series of Inquiries were held before Mr. Harold R. Leslie, M.B.E., T.D., Q.C., in Barrfields Pavilion, Largs on the 4th day of June, 1957.

APPENDIX V

Memorandum of Undertakings by the South of Scotland Electricity Board

In the event of (a) the applications by the South of Scotland Electricity Board (constituted under the Electricity (Scotland) Acts, 1943 to 1954) under the Electric Lighting Act, 1909 and under the Town and Country Planning (Scotland) Acts, 1947 and 1954 being approved, and (b) the South of Scotland Electricity

Board (Hunterston) Compulsory Purchase Order, 1956, being confirmed, by the Secretary of State for Scotland, the Board undertake as follows:—

I. NUCLEAR SAFETY

1. The Board undertake that such radioactive discharges as are made will be in accordance with such regulations as may be prescribed from time to time by the Secretary of State for Scotland, but until the Secretary of State has the power to make such regulations, the Board agree that their powers in relation to the discharge of radioactive wastes from this Station shall be subject to compliance with conditions and requirements similar to, and in all respects as effective as, those which apply to the A.E.A. Stations.

II. ACCESS BY VEHICULAR TRAFFIC

2. The proposed access road will, except as aftermentioned, be for the private use of the Board. The Board may, however, after the station has been commissioned, open the road to public vehicular traffic at such times and subject to such regulations as the Board may from time to time lay down.

III. PEDESTRIAN ACCESS

3. It is understood by the Board from Ayr County Council that two public rights of way for pedestrians extend as follows:—

- (a) From Hunterston Gate towards Portencross by way of Hunterston Drive following the seaward side of the wall from point B on the accompanying plan No. N/68, thence along a path passing close to Shore Cottage and thence generally following the line of the shore towards Portencross to the southmost boundary of the proposed site (hereinafter called the Hunterston right of way); and
- (b) From Fence Bay in the direction of Portencross following the line of the shore along Southannan Estate to a point near the end of Hunterston Drive where it joins the right of way mentioned above (hereinafter called the Fence Bay right of way).

The Board undertake that they will not interfere with these rights of way unless to such extent as may be necessary in the course of construction of the station and except where the proposed access road is placed on or crosses over them or either of them.

4. The proposed access road is not placed on any part of the Fence Bay right of way, but where it is placed on the Hunterston right of way it will be open to pedestrian use, and at the points where it crosses either of the rights of way the Board will ensure that access to the rights of way is maintained. In particular a gate of the kind commonly denominated cuckoo wicket for foot passengers will be erected at the point marked A on the said plan where it crosses the Hunterston right of way near Hunterston Drive. A similar gate will be provided at the junction of the two rights of way at the point marked B on the plan.

5. In any event a footpath for public use will be provided along the seaward side of the whole length of the proposed access road and within the roadside fences and boundaries.

IV. INTERESTS OF OWNERS AND OCCUPIERS

6. The Board undertake to erect and maintain stockproof or other farm fences along the landward side of the proposed access road in so far as necessary in conjunction with the existing wall to form a continuous line. Subject to any existing rights of way, and so far as may be required by the proprietors concerned, the Board will also erect and maintain similar fences along the access road on its seaward side and they will erect and maintain a suitable unclimbable security fence along the extreme southern boundary of the land to be acquired. If desired the latter fence will be erected before commencing construction operations. The Board will not otherwise fence the access road except to the landward side, opposite the station, where a security fence will be erected.

7. Culverts to accommodate the existing field drains and streams will be constructed by the Board along and under the proposed access road.

8. In addition to providing gates to maintain access to the public rights of way mentioned above, the Board also undertake to provide suitable crossing points across the access road by arrangement with the proprietors concerned.

9. In particular the Board undertake the following matters:—

(i) *Poteath Farm road*

To allow the proprietors and tenants of Poteath Farm free use of the proposed access road from the main road to where the access road will meet the existing Poteath Farm road at point C on the plan, with, if necessary, a servitude right of access from the point C northwestwards along the existing Poteath Farm road or other suitable alternative route to be provided by the Board, to the new Southannan boundary. The route of the said access shall be maintained by the Board in the same state as at present existing. A suitable junction will be formed and a gate will be provided if required. With regard to the shelter belt on the north bank of the Burn, the Board undertake to cut the trees only where these will interfere with the construction of the access road and the passage of traffic along it.

(ii) *Hunterston House access*

To allow the proprietrix of Hunterston House, if she so wishes, to use the proposed access road from a point near the junction of Hunterston Drive and Largs Avenue at point D on the plan as an access to the main public road. A suitable junction and gate will be provided if required by her, and new gates for farm traffic and vehicles will also be provided for access to Gull's Walk and field O.S. 868.

(iii) *Shore Cottage*

To provide gates for farm traffic and foot passengers at points E and F on the plan in order to give access to Shore Cottage from Hill House.

(iv) *Fences Farm*

To provide gates for farm traffic at points G and H on the plan in order to give access from Fences Farm road across the access road.

(v) *Goldenberry Farm*

To provide a route, if asked by the proprietrix of Hunterston Estate, from the existing Goldenberry Farm track at the eastern corner of field O.S. 789 at the point J on the plan across that field to the west boundary thereof on a line convenient to the requirements of the Station.

V. ARRANGEMENTS WHILE CONSTRUCTION WORK IS BEING CARRIED OUT

10. While the formation of the proposed access road and construction on the site are in progress the Board will take all reasonable steps to ensure that the ground affected is kept adequately fenced to prevent the straying of stock.

11. The Board will also ensure that where the use of the pedestrian rights of way or the existing farm roads or paths may be interrupted by construction work, such interruption will be kept to a minimum and a temporary alternative route provided.

VI. NATURE CONSERVANCY

12. The Board undertake to respect the spirit of the Notification by the Nature Conservancy in so far as this relates to the adjoining lands to the south.

IN WITNESS WHEREOF these presents consisting of this and the three preceding pages are, together with the said plan attached, sealed with the Common Seal of the said South of Scotland Electricity Board authenticated by the signatures of John Sidney Pickles, their Chairman, and John Meek, their Secretary, all at Largs on the Twelfth day of February in the year Nineteen hundred and fifty-seven.

(Signed) J. S. PICKLES, *Chairman*.

(Signed) J. MEEK, *Secretary*.